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ABSTRACT

In this fifth Report on Teaching compiled by Change Magazine, focus is on anthropology, foreign languages, and physics. Articles dealing with teaching competence at the higher education level in anthropology deal with both classroom and field instruction, written by: Francis L K. Hsu, Nathaniel Sheppard, Jr., Ronald Henkoff, Evan Jenkins, Liva Baker, Warren T. Morrill, R. Brooke Thomas and George Armelagos, M. H. Crawford, David H. Spain, and Marianne L. Stoller. College-level foreign language instruction effectiveness is examined by: Howard B. Altman and Richard I. Brod, Stan Luxenberg, William H. Trombley, Charles J. Sugnet, Peter Binzen, Henry M. Cordes, Howard Keller and John Ferguson, Joseph Fugate and William Pruitt, Claire Gaudiani, and Helga Slessarev. Authors submitting aricles on teaching college-level physics include: Arnold A. Strassenburg, Barry Mitzman, Sally Valente Kiester, Jerrold K. Footlick, Henry Weil, Milton Slawsky and Zaka Slawsky, L. David Roper, Margaret L. A. MacVicar, Virginia Rawlins, and Robert G. Fuller. This special report also includes a two-page assessment of in-service workshops and an index of subjects covered in all five special Reports on Teaching. (LBH)

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From the editors of

Change

The Magazine of Learning

REPORT ON TEACHING

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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ANALYSES OF SOME OF THE MOST NOTABLE IMPROVEMENTS IN AMERICAN UNDERGRADUATE TEACHING

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ABOUT THIS NATIONAL TEACHING PROGRAM

In thinking about the general prospects for raising teaching competence among American college faculty, one ought not fall prey to simplistic resolutions to a complex challenge. One temptation to be avoided is to think that such efforts at teaching improvement can be snatched up and then discarded as some first-aid kit of pedagogic resuscitation. Enormous and frequently unsuspected amounts of energy and time must be given to most forms of educational improvement, and one must also face the frequent possibility of disappointment. We still know too little about what works and what does not. Substantive evaluations of most such efforts remain scarce and are often swaddled in pseudosociological jargon. What is now essential is to have a clearer sense of what one is about in this business of teaching improvement, to allow for more tolerance of possible failure, and to have a more realistic sense of what might be accomplished.

There is some evidence to suggest that current efforts at enhancing teaching effectiveness touch least those faculty who need it most: These are the new teachers, fresh out of graduate schools, and faculty in the latter phase of their teaching careers. What is also evident is that most such programs involve already good teachers trying to become better ones, rather than those with less success with their students who tend to remain in their old holding patterns.

Teaching improvement efforts must surely be one of the less glamorous aspects of academic life. They are part of the academic mortar and are unlikely to produce heroic and widely applauded triumphs. Nonetheless, such efforts must now be seen at the center of any academic enterprise, since the Academy has entered a buyer's market that will no longer tolerate institutional and faculty diffidence in this regard.

—George W. Bonham

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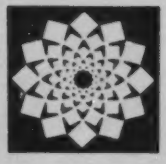

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THESE REPORTS ON TEACHING
Progress and Prospects

Although it seems strange to speak of tradition in an enterprise so young, this is the last Report on Teaching to follow what has become the traditional format for the series. The sixth and final Report, to be published in August 1978, will focus solely on outstanding interdisciplinary programs across the country and offer the results of an independent evaluation of this national effort to celebrate good teaching and encourage its improvement.

Three years have passed since the Reports were but an idea, and it has been a learning experience for the *Change* staff. With each new discipline, we've increased our understanding of the diversity—and commonality—of views and approaches encompassed in the fields covered. We hope the readers and users of the Reports have seen it too and have ventured beyond their own fields with empathy and an eye for the transferrable.

In deciding to feature, whenever possible, one social science, one hard science, and one humanistic discipline in each Report, we hoped to encourage an interest by all professors in the efforts of their colleagues in other fields toward this very common goal: the improvement of teaching and the increase in student learning in every subject.

The roadblocks to improving students' education don't really differ all that much from discipline to discipline. After acknowledging that each field has its unique characteristics which translate into special needs in the classroom, we are still struck by the similarities of the concerns. Though the historians and the chemists, the political scientists and the physicists may be worlds apart in the subject matter they teach, they are much closer than many are willing to admit in the difficulties each confronts when faced with a class of 15 or 50 or 500 undergraduates.

The introductory course, for one, is the migraine of every department in every discipline. Yet many teachers have been able to approach the problem with resourcefulness and creativity. Using media or self-paced instruction, peer teachers or computers, each discipline has its variation on the theme; but the challenge is the same everywhere and much can be learned from listening to the fresh ideas of others who see it from a different perspective.

After the first Report appeared, many suggestions were offered for a variety of changes. One of these was to list the disciplines included on the cover of the Reports. The publication would have much greater appeal for faculty, it was thought, if they could see their own disciplines prominently displayed. A "Report on Teaching" simply would never be a strong enough calling card. We've avoided that issue—with reason—and to some extent have gotten around it by sending each Report directly to the department heads in the fields covered. And although they too may not be enticed by the prospect of reading about teaching, they've no doubt been curious enough to leaf through the pages to find professionally accepted reading matter endorsed by their disciplinary associations.

How important is that endorsement? This leads to the somewhat worn argument that runs: Until the gatekeepers of professional prestige stand behind good teaching as an activity as worthy of recognition as research, all efforts to bring it into the limelight will be wasted. Yet this series of Reports stands in part as witness to the concern of the directors and education officers of the disciplinary associations, without which it never would have succeeded. And individual articles throughout the Reports attest to the willingness of many college and university administrators to underscore that concern.

It might be worth considering the possibility that some of these leaders are ahead of a pack that's unwilling to follow. There is a tremendous support system within the professoriat—exclusive of administrators or associations—that can choose for itself how to award the informal kind of prestige that often is much more powerful than any outside awards or titles. And only when more professors are willing to be outspokenly supportive of good teaching not only by colleagues within their own disciplines but by those outside them as well can the kind of environment be created where this program and similar efforts matter.

Hans Mauksch and Lawrence Rhoades said it well in the overview article for the sociology section of Report on Teaching #4: "One of the perplexing problems confronting any attempt to improve undergraduate teaching is the absence within academic disciplines of collegial communities based primarily on teaching." To carry that to its next logical step—and one that is not beyond the reach of concerned educators—perhaps it is entirely possible to create such communities that extend *beyond* academic disciplines, to the point where it's not the prestige of the individual professor or the total allegiance to the subject that matters as much as the education of every student.

—Joan L. Stableski

IN-SERVICE WORKSHOPS: DOES THE MEDIUM CONVEY THE MESSAGE?

by L. Richard Meeth

Traditionally, educators at all levels have gained recognition and increased pay by moving from institution to institution. From the institution's perspective, staff mobility also has been a way of sorting good employees from bad by offering more to those they wish to keep and less to those they hope will move on. But the days of high mobility are gone, probably for the next decade at least. As mobility has declined, individuals and institutions have had to find alternative ways to achieve the same goals. In-service workshops have become a primary vehicle for promotion, recognition, professional growth, and increased salary—in short, a substitute for mobility.

At the same time, and partially as a consequence of decreased movement, the in-service workshop has become a major medium for improving performance. Since institutions cannot, because of tenure or conscience, always let those people go who are less than outstanding, they have turned their attention to efforts to improve those individuals who will be with them for years to come. As a consequence, each year many institutions spend thousands of dollars sponsoring workshops designed for the professional development of participants, and much of the professional development of faculty has focused on improving teaching.

Very little research has been done, however, to determine whether these activities accomplish their goals, or if they make a positive difference in the behavior of participants. Several articles have been written questioning the value of the workshop as a vehicle for improving faculty performance or status. A few cries have been heard about the high cost of workshops and the meager evidence of their success, but, aside from individual, short-range assessments, no national effort has been made to evaluate the impact of this means of promoting educational change.

Do faculty and administrators actually improve performance as a result of attending one or more in-service workshops? Do they move upward in salary, position, and/or responsibility? If the answers are yes, then is the content of these workshops the primary catalyst or simply attendance at them that counts?

People attend workshops for a wide variety of reasons. Some go for rest and relaxation, others to break the monotony of their daily performance; still others attend to meet or make friends, to be seen by the "right" people, or because they need the continuing education credit. Some attend because they want to grow, because they think the topic interesting, or because they have a larger commitment to improving their teaching.

What structure produces best results? Does format make any difference? Do size, location, selection of participants, leadership, preset outcomes, follow-up, homework, and many other dimensions matter in the quality and quantity of impact? These and many other related questions about a growing multi-million-dollar national educational investment remain unanswered.

The present information on workshops to improve teaching leaves more questions unanswered than not. But a few things are known: America's college and university faculty attend an average of between one and two in-service or professional workshops a year, many designed explicitly or implicitly to improve their teaching performance. Evaluation of the effectiveness of these workshops is usually limited to an expression of pain or pleasure on the part of participants, and their immediate impressions of the experience. And we know, theoretically and experientially, that workshops can be made more effective. Several characteristics of seemingly effective workshops can be noted. Those that work well often have:

(1) *Preset outcomes* that are known to all potential participants before they become involved. These provide a precise behavioral description of what is expected in the workshop. They set the parameters and suggest the workload as well as portray what one might expect to learn, all of which can increase partici-

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pants' interest and decrease their anxiety about getting involved.

(2) *Prior readings* that are short, pointed pieces with built-in assignments. Such readings encourage participants to prepare for the workshop, especially if the readings are controversial. The advantage of this technique is that all participants start at a common level of understanding.

(3) *Involvement of participants* in structuring the outcome and the agenda. Including potential participants in the setting of outcomes and, once the workshop starts, leaving room to modify the agenda, gives people a greater feeling of responsibility for the workshop. By offering their judgments of what should take place, they invest something of themselves in insuring the success of the meeting.

(4) *Advanced commitment* by participants through contracts or statements of commitment. Before the workshop begins, it is important to explain in detail through a written statement what the workshop will provide and what participants should expect to accomplish. Once having signed such a statement, they have a much stronger commitment to, and a greater involvement in, the success of the workshop.

(5) *Brevity*. A two-day workshop often accomplishes more than a three-day workshop. As time goes on, participants need more breaks, and the assimilation level decreases unless new stimuli are introduced. Keeping the workshop on "company time" near the end of a week seems most effective; participants tend to feel a stronger obligation to serious work.

(6) *Rehearsed presentations* so that there are no negative surprises from speakers or leaders, or serious contradictions among them. Selecting known leadership is not always possible and "leading lights" in the field of teaching improvement may be terrible workshop leaders. It is often better to attract talented people closer to home who will be willing to prepare specifically for the workshop.

(7) *Clearly defined tasks* to be performed by participants. To hold a workshop and not require anything of those who come misses the opportunity for increased involvement, reinforcement of learning, and meaningful evaluation. Workshop groups should come up with questions for discussion in advance, and individuals—in pairs or groups—should be supplied with task worksheets. Simulations such as role playing also appear to be effective workshop techniques for increasing involvement.

(8) *Tests of knowledge, skills, and/or attitudes* acquired during the workshop. To reduce the anxiety level, the test answers can be handed out at the same time as the questions for self-scoring. Pre- and post-tests can help to measure the long-term value of the workshop.

(9) *Follow-up activity* or, as it is called in the schools, homework. Some tasks that people are asked to perform after they leave the workshop to synthesize what they have learned are never completed. Tasks should relate to the things attendees do in their daily work if they are to have the greatest potential for transfering insight into action.

(10) *Participant evaluation*. Most workshops ask sense-of-the-experience questions only during the final 10 minutes of the workshop, but if the 9 points listed above are used, the evaluation can be much broader, more related to learning, and include products of achievement. The best workshop evaluation is ongoing, from the first session to well after the last assignment has been completed, even if that is a week or a month after the workshop is over.

These 10 dimensions will not insure the success of any workshop. The content itself remains critical and the mix of persons involved continues to be the mystery ingredient of success. But these factors can help provide a context in which people take more seriously the medium for growth most often used today for teaching improvement. The medium does convey the message, but it may not be the message the designers and supporters intend unless much more study and care goes into the development and preparation of in-service workshops for improved teaching. □

ANTHROPOLOGY

THE ART OF TEACHING THE HUMAN SCIENCE

by Francis L.K. Hsu

The art of teaching anthropology to undergraduates is a hectic matter. This is especially true of cultural anthropology, which is the core of our discipline. For one thing, most of our courses of instruction remain noncumulative. Our curricula are organized into A, B, C, or 100, 200, 300 courses, from elementary to higher levels. But the gradation is more formal than real. Most students can take so-called advanced courses without having to suffer introductory ones. This is most unlike the situation in mathematics or physics, where students must go through the courses in their sequential order from elementary to intermediate to advanced.

Some anthropology departments see this lack of sequence as a problem and try consciously to modify it to make their curricula more cumulative. Others seem to share the view of sociologist Bernard Beck, who has taught a variety of courses from introductory sociology to social problems and theory, urban sociology, industrial sociology, and religion. Beck does not see a great deal of difference among these since sociology is "essentially undivided, consisting of similar conceptual and substantive issues in any setting."

Some departments use teaching aids such as films, tape recordings, and visits to museums. Others lead students directly to the field. In Macalester College's Ethnographic Field Work in American Society, for example, undergraduates do anthropology under close supervision of the teachers to gain "self-understanding" and "integration of knowledge." Such drastically differing approaches to a common discipline tell us that teaching anthropology to undergraduates is still a long way from maturity. But the main reason for the divergent approaches has to do with the nature of the discipline. There is a fundamental difference between sciences such as anthropology, which deal with human beings, and disciplines that deal with the physical universe or with animals other than man.

While animals are known to have emotions that govern their patterns of activity, such links are short-lived. The proverbial elephant may never forget, but there is no evidence that animals hate or love for long, and it appears particularly unlikely that emotional states carry over from generation to generation. But people relate to each other and to the rest of the world by role—their usefulness—and by affect—feeling.

We know role in various guises: skilled or unskilled labor, white-collar or blue-collar workers, dentists and diamond cutters, housekeepers, politicians, and so on. As our society has grown in complexity, so the number and variety of roles have expanded. In fact, role differentiation is the major concomitant of the growth in societal complexity. For example, today each candidate for national office is supported by an army of experts including speech writers, public relations men, technicians, and foot soldiers beyond the imagination of the small town politicians of yesteryear. And giant corporations often have more people on their payrolls than live in many small states of the United Nations.

Coming from a society where the role domain has nearly eclipsed the domain of feelings—even in the sexual sphere—it is no wonder that U.S. anthropologists tend to stress the former. Yet it is the domain of feelings that links us to our forebears. While roles may change in number and complexity with the growth of the industrial society, we still have the same kind of feelings as our ancestors who lived two or three thousand years ago: love, hate, rage, despair, endurance, hope, anxiety, forbearance, loyalty, betrayal, and so forth. The list is not long, and many of the terms are similar and even partially or wholly subsumable under each other. We moderns feel the same agony and joy, the same loyalty and duplicity as the ancients. That is why great fiction and poetry, great painting and sculpture, and great philosophies and ethical ideals survive the ages, while old books of science and technology, dependent on now outdated information, are forgotten.

However, the feelings that link Westerners are not expressed in the same way as are those linking men and women in other parts of the world. People may experience the same love, hate, and despair, but how they express these emotions and especially what makes them love, hate, or despair differ greatly. Each par-

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ticular culture has distinct patterns of feelings, transmitted from generation to generation through a particular social organization. And it is such patterns that determine the roles individuals assume, how well and happily they perform them, and in fact their outlook on life. Teachers of anthropology have yet to come to grips with these differences among societies.

Elementary psychology has taught us that no one can ever have a truly open mind, and anthropologists are no exception. Their minds are cluttered with assumptions about their own societies and cultures that invariably distort their observations. Consider the United States, where extreme individualism leads many people to be emotional isolates so that they need material Great Walls around themselves. Anthropologists reared in such circumstances quite understandably tend to exaggerate the negative consequences of poverty and crowding in other societies. The economic rationale is so strong here that some American anthropologists have even found an economic basis for Hindu India's custom of keeping sacred cows.

Perhaps under pressure of an inferiority complex vis-à-vis the physical sciences or the more quantitative of the social sciences, such as psychology and economics, some anthropologists are adding statistical hardware to their research and writing. There is nothing wrong with moving toward the quantitative per se; with all sciences, anthropology shares the need for progression from the qualitative to the quantitative. But we must make sure what we quantify are the relevant variables. I can go to any beach and separate the pebbles according to size, color, or shape, and subject the results of my labors to fancy statistical techniques, but all this will be useless if determining the tides was my purpose in the first place.

What we need in anthropology is to deduce premises or postulates about the human condition from the characteristic patterns of affect of each society and culture. These will serve the teacher as guides to a variety of cultures and will prevent anthropologists from facilely declaring to their students that what they see through their Western eyes is the *human* condition. For human beings do not feel the same in diverse societies about their fellow humans, their gods, and objects, and in the long run such differences will find expression in their individual and group behavior. Furthermore, there is no consistent evidence that societies with diverse cultural heritages, even when subject to the same transforming forces, will grow closer in kind. That is why each culture has its own distinct art, literature, folklore, and myths that do not seem to lose their basic characteristics in spite of contact and diffusion. Thus the Catholics and Protestants of Northern Ireland react to each other on the basis of grievances 300 years old and we Americans still teach our young the *Illiad* and continue that glory by way of *Moby Dick* and *The Old Man and the Sea*. Yet those anthropologists who think of mankind in terms of the rural/urban dichotomy have yet to see that Indian villagers do not behave and react emotionally the same way Chinese peasants do. And some anthropologists are only beginning to see that in spite of a spectacular record of industrialization and nearly wholesale adoption of Western customs, the Japanese employer/employee relationship and merchant/government relationship remain distinctively Japanese.

Since an awareness of affective patterns is crucial in building our discipline and in teaching it to others, we need to take some steps to fix its place more firmly. For a start, we must increase the number of faculty members and graduate students whose early roots were non-Western. This will help to offset the pervasive Western patterns of affect that underlie our concepts, theories, and emphases. We also need to pay greater attention to area courses (Cultures of East Africa, Peoples of Japan, the Village in China, and the like). There is a prevailing idea among some anthropologists that area courses, like area programs, are passé. Three reasons may account for this view: One, a scholar who describes cultures is thought to be less prestigious in the profession than one who deals with theories. Two, excessive emphasis on the role domain has often made the teaching of area courses very repetitive and boring; there is little new ground to break. Three, if one sees the world through Western eyes, all these diverse cultures eventually will change beyond recognition anyway under the impact of Western industrialization, urbanization, and modernization.

Finally, affective awareness can be strengthened by the technique of comparison, especially between the unfamiliar non-Western ways of doing things and the Western ways most of us have lived by. All too often our scholars speak of the resistance to change in other cultures but fail to recognize that the search for change in their own culture is very traditional. Americans tend to search for new places to live, new means of amusement, new ways of romance and gratification; in short, new worlds to conquer. But have we stopped to ask whether our own obsession with the new is a form of culturally determined irrationality?

In physical matters, 80 degrees Fahrenheit means the same everywhere. But in human affairs we have no comparable quantitative certainty. How do we measure despotism? What percentage of a population must be in jail before a society is designated as despotic? How do we gauge the success or failure of an economic system? What is the level of unemployment that determines its health or sickness? It is only when we compare similar phenomena in two or more societies (one of them preferably the home of the anthropologist) that we come closer to the real forces behind the behavior we are observing. □

PRACTICING WHAT THEY TEACH IN THE FIELD, IN THE MUSEUM, AND IN THE CLASSROOM

by Nathaniel Sheppard, Jr.

Walking briskly across the chilly, windswept grounds of Beloit College, an anthropology professor points toward numerous historic Indian ceremonial and burial mounds cradled under now barren trees that fleck this small campus of 1,200 students near Wisconsin's southern border. "Over the years we've been able to partially excavate a few of these mounds, giving students a chance to see and touch some of the relics we talk about in class," the professor tells a visitor. "It is one thing to tell students what to do and what to look for on some anthropological dig in the future, but nothing beats giving them a chance to actually carry out the techniques and handle objects as you discuss them."

It is this undergirding philosophy—that students should learn anthropology by doing anthropology—that is the backbone of Beloit's undergraduate program in anthropology. The Beloit approach is orchestrated through a range of courses and field schools that are usually available only at the graduate level. These schools, along with the added resource of an anthropology museum right on campus, have helped earn the program wide respectability and set it of among peer colleges.

Beloit's anthropology department offers 22 introductory to advanced courses in cultural, social, and physical anthropology and archeology. These are taught by the department's three associate and two assistant professors—one of whom, Edson Way, a physical anthropologist, is a Beloit graduate. The 131-year-old College is built on land once used by the Woodland Indians for ceremonies and burials. It is now part of a sleepy, conservative town of about 25,000 located within two hours of the additional resources of the Field Museum of Natural History, the University of Chicago, the Milwaukee Public Museum, and the University of Wisconsin.

The College's offerings in anthropology reach far back into the private institution's history. Out of the three members of the first graduating class, one went on to become an archeologist. Ask any anthropology professor or student at Beloit what makes their program so special, and invariably they will answer, almost as if rehearsed, that it is the College's field school program and its Logan Museum of Anthropology. "On the surface we look like a standard, conservative, undergraduate anthropology department, but underneath we are much more like a graduate program because of our field work," remarks Daniel Shea, an archeologist.

With 38 students majoring in anthropology in 1977-78, the discipline ranks first as the most popular major at Beloit and third in the number of students participating in it. Each year about one third of the anthropology majors participate in an archeology or ethnology field school, getting what Provost Zeddie Bowen describes as hands-on experience. "We want our students to get real practical experience," he explains. "We want them to feel the frustration of working in the field for days before turning up anything and to do the drone work of cataloguing and taking pictures of materials they find. This and the excellent breadth of courses from physical anthropology to linguistics gives our students training usually found at the graduate level."

Last April, 22 students and 2 staff members studied the prehistoric cultural resources in upstate Wisconsin while living on the Red Cliff Indian reservation. There the students were able to use the techniques they had been taught in site survey, test excavation, and laboratory testing in their efforts to discover where prehistoric peoples settled in the region and why. This winter, 20 students will travel with Robert Hinshaw, a social anthropologist and chairman of the anthropolcgy department, to Mayan communities in Guatemala to examine the economic and social impact of tourism and the cultural impact of natural disasters such as earthquakes that have devastated parts of that country. Next summer another group of students will do archeological field study with Daniel Shea in Chile.

Chairman Hinshaw, who previously was president of Wilmington College in Ohio and is in his second year at Beloit, believes the field school experience is important to students for many reasons. "For one, it allows students to determine at the undergraduate level if they are temperamentally suited for careers in anthropology. Only through several months of field work can this be done," he points out. "We endeavor to acquaint majors with the requirements for success in anthropological careers and the range of careers benefiting directly and indirectly from an anthropological perspective and training, and to advise them candidly on the feasibility of graduate study in the discipline."

The philosophy of the Beloit anthropology department is steeped in that of the College itself—to provide a classic tradition with innovation and experimentation in a setting that allows for intimate faculty/student relationships. "We are old-fashioned but not afraid to try new ways of doing things, as long as teaching maintains priority over research," Bowen says.

The anthropology department has been able to achieve a rich compost of both teaching and research. Virtually all

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NATHANIEL SHEPPARD, JR., is a Chicago correspondent for the New York Times.

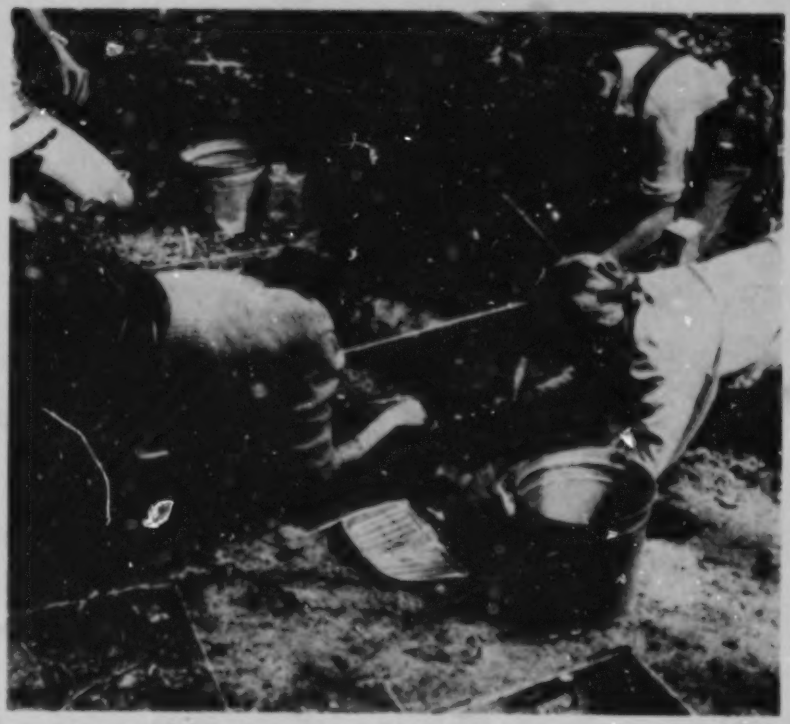
of the field schools, for example, relate to areas of research by faculty. "This facilitates exposing students to the impact of that ongoing research on the careers and lives of the faculty and their families," Hinshaw notes. "While our research usually has been along traditional lines of anthropological inquiry, we have also offered interdisciplinary courses in cultural resource management, the social aftermath of natural disasters, adaptation under stress in the Arctic environments, female roles viewed cross-culturally, pre-Colombian art and architecture, and traditional American folk music." Students generally laud the field school program for embellishing their studies with the added dimension of travel and contact with other cultures. "We get a chance to practice what they teach," a student mused.

Through the Logan Museum, the field school program has long supported anthropological expeditions around the world. The groundwork was laid in 1894 when Frank Logan purchased a collection of mostly stonework artifacts from the Colombian exposition in Chicago. Four years later he established the Logan Museum at the College and provided it with a substantial endowment that in those days generated an annual yield of close to $30,000.

The Museum, in turn, financed numerous field expeditions around the world. Field crews, individual students, and research teams, flying the College's flag, made numerous trips to places such as Algeria, France, and the Gobi Desert. Much of the Museum's money went to an aggressive acquisition program in which many historic artifacts from the U.S. and abroad were purchased. The acquisitions slowed following 1929, however, after the depression reduced investment income.

Today, the Museum, housed next to the new Godfrey anthropology building, continues to provide important support services for the department's programs with an impressive collection of historic relics—one of the most extensive connected to an undergraduate anthropology program—and more than 3,000 volumes and 20 journals on anthropology. All of the exhibits are researched and set up by students.

A lounge situated between classrooms and instructors' offices is the hub of activity for the department. It is the scene of frequent informal discussions and debates among students and between students and professors. It is common and encouraged that anyone walk up and join in on discussions. Most of the anthropology classes are small to moderate in size with 13 to 20 students each, although increasing popularity in anthropology as a major at Beloit has swollen the sizes of introductory courses in recent years. The department places great emphasis on student input in its program. Students are represented at all departmental meetings and their views are solicited on major issues and planning. They also are regularly assigned to lead classroom discussions on topics being studied. "The study of humankind is avocation as well as vocation for a committed anthropologist," Hinshaw says. "It is an attitudinal stance which brings its distinctive perspective to bear on the many facets of a professor's public and private life. We try to open our lives to our students to the extent our energy and student interest warrant, sharing the formative experiences and ethical dilemmas which have contributed to and flowed from our careers in an-



Students (above) excavate at the Apostle Islands field school. Teaching assistant Roberta deBoer describes a backstrap loom in a class on cultures of Latin America.

Students work on a Woodland Indians display at the Logan Museum.

thropology." This sharing begins in the classroom where the atmosphere is quite informal, carries over into faculty homes where classes sometimes meet, and is most intense in the field schools.

Accurately assessing the success of any school's approach to anthropology teaching is made difficult by the lack of a critical rating system by outside anthropological organizations. Instead Beloit relies in part on self-evaluations of courses by professors and evaluations of courses and instructors by students—both of which are subject to personal biases. Professors in the department insist, however, that the best measure is the success of the College's graduates, who they assert have contributed significantly to the corps of professional anthropologists around the world.

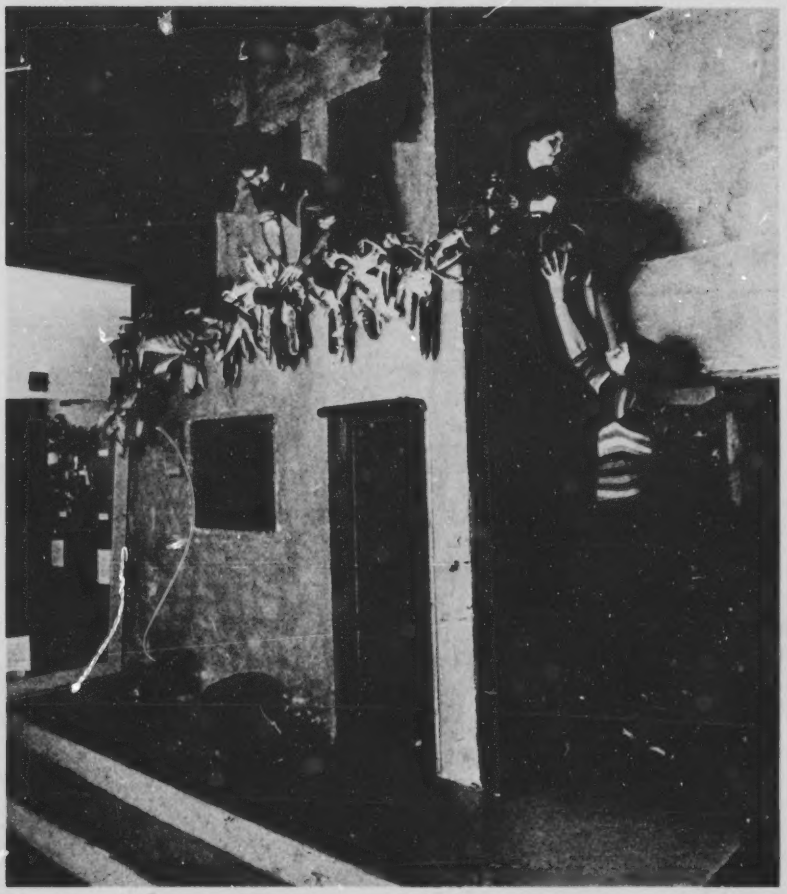
The program is, of course, not without its shortcomings and criticisms from faculty and students alike. Among the most frequently cited are a strapped departmental budget, a growing student enrollment without a corresponding increase in the faculty, and the dichotomy of any anthropology department that seeks to teach students about pluralistic societies but that finds it difficult to attract and retain a racially and sexually mixed faculty and student enrollment. As a result of repeated slashes in the departmental budget—it was trimmed 25 percent last year—the department has been unable to step up the Logan Museum's relic acquisition program or to lighten the teaching load of its director.

Another problem faculty members said had slowed the progress of the department but which they now feel is on the way to resolution is a lack of administrative and financial support commensurate with the prestige the department has gained in anthropology circles. "We used to be in a position where the department was well respected throughout the country but the victim of petty jealousy right here on campus," one veteran professor of the department says. "We never received a budget that was in line with that national prestige or the number of students we attracted." The feeling among most of the anthropology staff now is that the current administration at Beloit will be more sensitive to its need and generally more supportive.

Students complain that the financial belt tightening the department has been forced to undergo has meant that they have to pay an increasing share of the cost of certain field trips and live with short supplies of some items, such as microscopes. One said students' budgets are often strapped, largely because of the approximately $5,500 a year needed for tuition, room, and board.

There are now five professors in the department where in previous years there were seven. "As a result, there is the real possibility that we may be spreading ourselves too thin," observes Robert J. Salzer, the senior member of the department, now in his twelfth year at Beloit, who runs the Logan Museum part time in addition to teaching classes. "Where normally introductory classes have 20 to 30 students, they now have 40 to 50 students," he said. "When we had a full complement of seven teachers we were able to conduct more classes and keep class sizes down. It means we may not be able to provide the close contact we have in the past."

The loss of two faculty also has hurt operation of the Museum; Salzer and assistant curator Druscilla Freeman carry the full responsibility. "We would like to reestablish an aggressive acquisi-



Students complete a pueblo in the Logan Museum.

tion program," Hinshaw says. Funding opportunities are abundant and would allow the College to upgrade the Museum and provide more training in the museum field, notes Salzer. Funds would have to be solicited by someone working full time in the Museum's interest, he adds, and matching sums would be required from Beloit.

Some students and faculty members say they think the anthropology department should place greater emphasis on field work in the College's immediate environment, studying American subcultures rather than concentrating mostly on foreign cultures. Specifically, they suggested that there was much to be studied about local Hispanic and black enclaves that migrated to the Beloit area many years ago and the American Indians who once flourished in the area. But field study at present, they acknowledge, is largely a product of the professors' interest and training and that interest is now on other ongoing projects.

Perhaps the most ticklish problem for the Beloit department has been their inability and that of the College as a whole to attract and retain an ethnically diverse faculty and student population. The result has been an all-white, all-male faculty teaching an all-white student body how to understand pluralistic societies. "We had some movement toward integration of students and the faculty during the 1960s," Hinshaw explains, "but we are back to a less heterogeneous population." He believes this was in part due to the high cost of tuition and the fact that the city of Beloit has limited social offerings. Department professors and administration officials alike say Beloit has been unable to compete with salaries offered by other colleges and thus cannot seem to attract minority group professors who now are in demand.

"We had a Japanese lady with strong views on women's rights," Salzer says. "She was extremely valuable to us, not only because of that, but because she was a good anthropologist and from another culture. But she went to a larger university where she's making much more money. So since we can't get other cultures to come to us, we go to them through our field school program."

In addition to the field schools, anthropology students, like all Beloit students, are required to spend about four months in a required, noncredit field term. The field term is not a part of the anthropology department. "Whereas students are full-time students in the field schools, they are full-time workers in the field term, expanding their preprofessional experience," explains John Biester, who heads the 13-year-old program. In the field term, students work at approved jobs located in areas away from their homes. The work may be for pay or voluntary and should be related to the student's career goals. During this period students have more time to analyze than they do in the field schools, Biester says. "For example, in a field school the students might be taught the mechanics of excavation and how to clean and catalogue items, but in the field term they learn how to interpret what they've found."

Beloit's anthropology department is abounding with change. Of the five faculty members two are new to the College—Chairman Hinshaw, whose specialty is social anthropology, and Lawrence B. Breitborde, who received his PhD earlier this year and will bolster the offerings in linguistics. The curriculum underwent complete revision last year with course offerings in linguistics being added to augment its scope. Also established was a rotating, two-member advising committee which will work with students to plan their studies and help provide continuity of approach to the major. But whatever the structural changes, they will continue to be made on the Beloit philosophy that students should learn anthropology by doing anthropology. ■

Learning experience:
Anthropology at Beloit College. College enrollment: 1044. Anthropology majors: 65.

Other descriptions:
Descriptive pamphlet available upon request.

Contact:
Robert E. Hinshaw, Department of Anthropology, Beloit College, Beloit, Wisconsin 53511, (608) 365-3391.

LEARNING BY DIGGING: THE KAMPSVILLE CREDO

by Ronald Henkoff

In 1950 Stuart Struever, who directs Northwestern University's Archeological Field School, was a "blasé college student" looking for a summer job. By "sheer luck" he heard that an archeological dig near his rural Illinois home was looking for laborers. He signed on as a member of a three-man crew excavating LaSalle's Fort St. Louis in the Ohio River Valley. "The first day on the site they handed me tools and said, 'Dig,'" Struever recalls. "I was being clinically trained right at the outset.

"I got so damn excited about the work that it turned me around from a ho-hum student to a very good student—immediately," says Struever, a trim, energetic man with slightly disheveled black hair. The dig also sparked in him ideas that would eventually find an outlet in Northwestern's field school.

The school, founded in 1968, is literally nestled in Kampsville, Illinois, a tiny farming town on the Illinois River about 50 miles north of St. Louis. Two-story, turn-of-the-century houses in white, pale green, and dusty gray line the streets. But behind those unchanged facades the field school has set up a network of laboratories, offices, and classrooms. Kampsville is at the hub of an estimated 900 archeological sites, about six of which are currently being excavated by field school staff and students. At the Koster site, named after the farmer who owns the land, diggers have unearthed 12 different civilizations. The oldest thus far uncovered dates from 7000 B.C. The site is a 4,000-square-foot, L-shaped pit, 36 feet deep at its lowest point.

The field school schedules sessions for students of all ages from all over the country. Over 950 college, high school, and junior high school students, as well as groups of adults, study there over Kampsville's seven-month season. But the longest stretch is a 10-week summer session reserved for 100 college students who come from as many institutions. Another 45 college students serve as research and teaching assistants and receive a small stipend.

Seated in his large, cluttered office at Northwestern's Evanston campus, Struever chatted about the summer program's approach. "The unusual thing is that the student is placed immediately in the role of researcher. Disciplined discovery, recovery, and recording are required, and the students realize this because they begin to feel very early that they are valuable contributors to the research."

While the credo at Kampsville—learning by digging—is the same, the educational process is not as chancy as Struever's own baptismal at Fort St. Louis. Assembled at Kampsville to help the students make sense out of their findings is a coterie of experts in botany, zoology, geology, human osteology, statistics, malacology (the study of snails), and so on. The cast changes slightly from season to season. Such a grouping of specialists so close to the digging is unique in the archeological world. It makes the field school what Struever calls an "evolving experiment in archeology" and puts it at the forefront of the so-called New Archeology.

"Archeology," in the words of one Kampsville instructor, "used to be just a chronology. It was the study of how this arrowhead begat that arrowhead. One professor would work with one group of students. They would learn everything he knew, but that's all." The new archeology, by contrast, is interdisciplinary; it seeks to infer behavioral patterns, not merely dates. From the remnants of plants, tools, shells, and bones found at the Koster site, the Kampsville staff has begun to piece together the daily habits, diet, and life span of early North Americans. Working in concert, the specialists at Kampsville have determined that people living at Koster in 5000 B.C. had a high protein intake, based chiefly on hickory nuts, and that, contrary to what is believed about early North American Indians, they did not live on the edge of starvation but actually had a secure diet and a large amount of leisure time.

The kind of archeologist Struever hopes to train at the field school must know not only how to collect data, but also what to ask the specialists and how to synthesize their answers. Struever, who has been digging in the Illinois River Valley for 19 years, likens Kampsville to a medical school. "Under the old system of learning to be a doctor, a student would just follow around some country doctor on his rounds. But the medical profession learned long ago the benefits of getting together specialists in biochemistry, orthopedics, pathology, and so on. It's just taken archeology a little longer to come to the same conclusion."

In its educational approach, the field school is not all that unusual. Participatory learning and interdisciplinary teaching have been tried at countless campuses. What is striking about Kampsville, though, is its success. While many other innovative programs have let their academic standards slip, the field school demands enormous amounts of work from its students, and, with few exceptions, the students respond.

"You really get into the work down here," says Karen Atwell, a Northwestern junior, mud-splotched and sunburned from digging at Worthy Merrigan, one of the newer sites. Atwell, who is doing independent studies in lab

RONALD HENKOFF is a free-lance writer whose articles have appeared in the Village Voice and MORE.

Photos by D.R. Beston

The main trench at the Koster site (above) is the scene of excavation of the ruins of a village dating to 6500 B.C. Below, professors and students discuss how prehistoric flint implements were manufactured.

work, is the only undergraduate still in town late in the fall when most of the sites have been closed down for the winter. An able student, she served as a supervisor last summer for some of the week-long junior high school field programs. "You really get to know everybody well. The supervisors and professors are willing to help you."

Atwell stoops to show part of what she's discovered. In the light brown, tightly compacted soil she has drawn six hand-sized circles, outlining the holes in which, she hypothesizes, posts for an ancient hut were once sunk. She has based her selection on color and texture differentiations (called "features") in the soil. To the untrained eye Atwell's choices look random. But, as Ann Koski, an experienced supervisor, surveys the circles for the first time, she singles one out. "They all look pretty good, except for that one," she says. The process of identifying one-time structures simply from postholes is still evolving among archeologists. As is typical at Kampsville, students and teachers are learning together.

Student-teacher communication and hard work thrive largely because there is only one game in town: archeology. There are no movie theaters, tennis courts, plays, beer halls, or football games. This is by design. "Colleges today," says Struever, "are like Hilton Hotels." Kampsville students rise at 5 a.m., labor in the field for 10 hours in temperatures that may reach 100 degrees or more, eat dinner, attend lectures, work in the labs, and then go to bed. They have all of Wednesday and half of Sunday off.

Most students in the summer program specialize in field methods. They take two required courses—Archeological Field Methods and Archeology and the Natural Sciences—and one elective. A small group that concentrates on laboratory work takes the natural sciences class and one or two specialized lab courses. For the field methods course students prepare a 20-page, documented essay on a hypothetical archeological problem, using Kampsville's fully stocked archeological library to supplement their on-site experience.

The field school has a markedly low attrition rate. In each of the past five summers only one to three students have gone home early. There are two reasons for this: First, the program's high cost ($1,040 per student) tends to dissuade nonserious students from ever applying. Second, goofing off is virtually impossible. Instructors work side by side with the students 10 to 12 hours a day.

Kenneth Farnsworth, former supervisor of the Koster site and now at the Kampsville archeological center, knows well the benefits of constant professorial attention. In 1968 Farnsworth, now a tall, sandy-haired archeologist with Ben Franklin glasses, was a reluctant undergraduate in engineering at Northwestern. "I was in college because that's what my parents said I should do, and I was studying to be an engineer because that's what the aptitude test said I

A student carefully smooths an earth wall, noting the layers of prehistoric culture reflected in the soil bands. At the Kampsville archeological center students wash the artifacts they have excavated, while another student (right) catalogues artifacts in the Kampsville zoology lab.

should become." Interested in paleontology as a kid, Farnsworth signed up for an introductory on-campus course with Struever. Impressed by Farnsworth's performance, Struever invited him to apply to the field school for the following summer. Farnsworth subsequently went on to earn a master's in archeology at the University of Michigan, spending every summer in Kampsville.

"I took some courses when I was an undergrad where the professor didn't even know if I was there or not," Farnsworth recalls. "Some of the stuff went right by me, and they didn't even know I was missing it. All they knew about you was what you wrote on a piece of paper in the middle and at the end of the course. That doesn't happen at the field school. If some student isn't getting it, the instructor knows."

Aside from evaluating students on the spot, the staff meets weekly to discuss student progress. Near the end of the summer instructors meet one-on-one with students to tell them how they can improve their performances to achieve better grades. The close daily contact also puts the teacher on trial. The better able a teacher is to communicate, the more professional the students' digging will be. "You better hope you can teach," says Farnsworth, "because if you can't, more or less of your own volition you will have destroyed an archeological site."

For teachers the challenges make the work rewarding. "It's a lot more spontaneous than classroom teaching," says

Michael Wiant, who turned to archeology after earning a teaching certificate in elementary and secondary education and now supervises the Koster site. "It's not like walking in with a prepared lecture. You never know what you're going to dig up, so you never know what questions the students are going to ask."

Is the field school meeting Struever's goal of training "new archeologists"? Yes and no. Roughly one half of the students at Kampsville are or will become archeology/anthropology majors. The other half are receiving something Struever never expected to be providing—a liberal arts education. "Many students come from colleges where they're not getting a liberal arts education," he says. "But an individual goes to college not just to develop skills but to learn processes by which he can understand the world around him. An individual has to develop the personal capacity to evaluate things. We teach that at the field school."

In the view of many participating faculty members, however, the field school has not yet found quite the right teaching formula—either for liberal arts students or for bonafide archeologists-in-training. The most common criticism is that the program skimps on lab work and theory. "Students can learn a lot not being at the site. Excavating for 10 hours a day can get so boring. The students begin to feel like they're just laborers. It would be nice to add more dimensions, in more detail," says Wiant. All students work in the general laboratory at night, cleaning the articles they've found during the day. But many students, Wiant says, complain that they don't learn enough about what happens in the specialized labs where the remnants are analyzed by botanists, zoologists, and other experts.

Part of the problem is time. Ten weeks is not long for the painstaking brushing and sifting that archeology demands. And students who return for a second summer do acquire more expertise in the specialties. Another factor that discourages theoretical work, according to Struever, is that professional archeologists have been slow to recognize the value of the Kampsville approach.

"The profession has yet to wake up to this kind of setup," he says. "Ours is an extremely effective way to train young professionals, and I wish the profession would realize this. I wish more experts would come to Kampsville. And I wish the profession demanded more skills. We'd like to teach a course in advanced surveying methods, teaching a student all of the specialized skills needed to plan and conduct a site excavation on his own. But if we offered such a course, we'd have little or no enrollment, because the students know the profession doesn't demand that archeologists know how to be surveyors."

Several current and former students express the view that the field school is ahead not only of archeology in general but of the Northwestern anthropology department, of which Struever is chairman. The department, Karen Atwell and Ann Koski point out, has its fair share of teachers who won't go out of their way to help students or who don't stress the importance of practical experience. Some of the same professors, they say, actually change gears when they get to Kampsville, where there are fewer distractions. However, the department's faculty as a whole strongly supports the field school. So does the University's administration. Struever praises Northwestern for the renewed emphasis it has put on teaching. "Nobody at any university could have more freedom than I do. Period," he says. However, he does wish the University would give him more money.

Money is the bugaboo of all archeological research. Most digs subsist solely on government grants. But the field school is different. One reason the school is located in southern Illinois, and not Peru or Anatolia, is to attract donations from Northwestern alumni and Chicago and St. Louis corporations, who can see how their money is being used. The field school and research programs at Kampsville operate on about $1 million a year, only a small portion of which is covered by tuition fees. Northwestern provides 20 percent of the funds, and various government agencies (the National Science Foundation, National Endowment for the Humanities, Illinois Department of Conservation, etc.) furnish another 20 percent. The rest comes from alumni and over 100 corporations. Their contributions are channeled through the nonprofit Foundation for Illinois Archeology, which was set up by Struever to aid the Northwestern field schools and the Kampsville-based research program.

Kampsville's location also helps keep the cost down. Since the small town is economically depressed, real estate is dirt cheap. Buildings cost one twentieth of what they would go for in Evanston. Kampsville's proximity to Chicago (six hours by bus) and St. Louis also minimizes student and faculty transportation expenses.

Struever tries hard to keep Kampsville on the map. The Koster excavations have been written up in the *Chicago Tribune*, the *New York Times*, *Psychology Today*, the *World Book Encyclopedia Year Book*, and a host of other publications. As many as 30,000 people annually visit the sites, the one-room museum, the laboratories, the bookstore, and the library. Four speakers tour the country year-round, lecturing on the project and advising other archeology programs.

This past summer, the school played host to John White, an expert in comparative archeology who constructs modern facsimiles of tools, clothing, and pottery of the civilization being investigated. White, who formerly directed the Native American program at the Field Museum in Chicago, volunteered his services, and was, according to one teacher, "always surrounded by 20 to 30 enthusiastic students." One product of White's work, a dug-out elm canoe, is on display at the on-site museum. Students last summer requested that more comparative archeology be built into the program. In keeping with the philosophy of an "evolving experiment in archeology," Struever and his colleagues are considering ways to integrate that study into the curriculum. "Because we're not restricted by many of the traditional constraints you find in a classroom," says Michael Wiant, "the sky's the limit here." ■

Learning experience:
Archeological field schools conducted each summer at the Kampsville Archeological Center. Fifteen undergraduate field and laboratory courses. Students from any university or college may apply. No prerequisites.

Other descriptions:
"The Koster Expedition and the New Archeology," *The Science Teacher* 42, No. 3, March 1975.
"The New Archeology," *Psychology Today* 8, No. 12, May, 1975.
Various publications are available without charge from the Northwestern Archeological Program, 2000 Sheridan Road, Evanston, Illinois 60201, (312) 492-5300 or 492-7463.

Contact:
Stuart Struever, Director, Northwestern Archeological Program, 200 Sheridan Road, Evanston, Illinois 60201, (312) 492-5300 or 492-7463.

THE NEW ETHNOGRAPHY: LANGUAGE AS THE KEY TO CULTURE

by Evan Jenkins

Armed with a tape recorder, Steve Burns, a student at Macalester College, drives from St. Paul to a modest home in the suburb of Roseville one fall night to do anthropological research. The culture he is investigating is miles away—a trucking company in the city. Although he plans to visit the company eventually, his guide to the culture is in the kitchen of the little house in Roseville: Dave Peterson, who works for the concern as a coding clerk.

Peterson is Steve's "informant" in the preparation of an ethnography, a word that denotes both the process of getting information about a culture and the written description that results from the study. Steve's ultimate goal is a term paper—an ethnography—describing Peterson's work culture (technically, "cultural scene"). His first goal is to understand the culture as Peterson, the insider, understands it. And the most important route to that understanding is the insider's language.

Steve, a junior from Omaha who hopes to become an electrical engineer, is one of 13 students enrolled in Anthropology 30, Ethnographic Field Work in American Society. Besides the trucking company, the cultures under examination during the semester include a treatment center for quadriplegics, a bakery, and the lot of a policeman on the midnight-to-eight shift.

The instructor for Anthropology 30 is James P. Spradley, who used the methods he is now teaching to students to make a reputation in his field as an authority on skid row alcoholics. Spradley and his Macalester colleague David W. McCurdy designed Anthropology 30 and alternate teaching it each semester.

The basic text for the course is *The Cultural Experience: Ethnography in a Complex Society*. Published in 1972, it consists of five chapters, coauthored by Spradley and McCurdy and laying out the concepts and methods of ethnography, and 12 papers written by Macalester undergraduates using those concepts and methods as taught by the authors. The subjects of the papers include such cultures as a jewelry store, an apartment complex for the aged, a third-grade class, and a car-theft ring.

The two teachers developed the course and wrote the text partly in reaction against practices and approaches in anthropology that they found wanting. Both had long been convinced that two hoary traditions of the discipline were outdated: the emphasis on field work in remote places among exotically different peoples and the delay in that field work until the would-be anthropologist is well along in graduate school.

Separately, each had experimented with sending undergraduates into the field, Spradley while teaching in Seattle and McCurdy in St. Paul. The results, they say, were spotty; what was needed was a well-defined system that undergraduates could learn and use while learning. Also separately, each man had become interested in an approach to ethnography called ethnographic semantics, or the New Ethnography. It deemphasizes such staples of anthropology as participant observation, the taking of life histories, and the use of elaborate questionnaires. The major emphasis, instead, is on language as the key that unlocks a culture and lets the ethnographer inside.

"The aim of ethnographic semantics," say McCurdy and Spradley in their text for Anthropology 30, "is to discover the characteristic ways a people categorize, code, and define their own experience." Or as Spradley put it recently in a conversation about anthropology in general: "You have to start with language. As you learn the language you learn the culture." To which McCurdy added—the two have a way of elaborating each other's thoughts—"And it's the words they use that tell you what's important to *them*."

McCurdy, now 42 years old, joined the faculty at Macalester in 1966 and recruited Spradley three years later. Spradley, now 44, by then had used ethnographic semantics methods in his study of tramps, and when he and McCurdy met at a conference, McCurdy was favorably impressed. "I was involved at the time in efforts to block the construction of a nuclear plant, and Jim started asking me about that," McCurdy recalls. "I was just amazed at the great questions he asked."

Teamed up at Macalester, the two at first sat in on each other's classes and took notes on the questions students asked as they attempted to do ethnography for various courses. In particular, they focused on the problems that arose in Anthropology 30 after Spradley started the course in 1971. From the problems, questions, and answers came a revised course and the text that goes with it.

Students in the course have usually

EVAN JENKINS is an assistant news editor for the New York Times.

taken introductory anthropology, and the small group is a combination of both majors and nonmajors. Their first step is to select a culture for study. The instructor shares his experience of the kinds of cultural scenes that work well for the course and the kinds that don't, but possibilities are almost limitless; some students are referred to the Yellow Pages. With the subject selected and approved, the students' next job is to find an informant. The instructor suggests qualities to look for, along with strategies for making the approach. Some students just call or knock on the door—going "cold turkey"—and some use a middle man, an acquaintance who knows someone in the culture selected.

Once launched, the students follow meticulously detailed procedures for interviewing (usually once a week through the semester), spotting key elements in the informant's language, discovering and plotting the culture's organization as it emerges through semantic relationships between terms, and finally describing it all in the term-paper ethnography.

The course is demanding; students report spending three to eight hours a week just transcribing tape-recorded interviews. Class time varies with the way the course is taught. A double-credit course, like the one offered last semester, requires about eight hours in the classroom each week. Over the semester, half the class time is devoted to intensive work on writing skills. That is omitted when the course is offered for standard credit, and class time is cut to about four hours.

In the early stages students encounter anxiety, frustration, sometimes boredom. McCurdy has learned to recognize the phases. "The first problem is that students have to establish rapport with the informant, and it's very hard to write rules for dealing with people," he says. "And you have to get the informant to work a bit; he may think you know more than you do. There's also a tendency for the informant to think after two or three sessions that he's told you everything, and the student may think he's run out of questions." The problems that arise are discussed in class sessions, with both instructor and students offering possible solutions.

In class one afternoon in midsemester, Katy Diggins, a junior from Rapid City, South Dakota, who is majoring in anthropology, complains about the boredom problem. Her informant is a radio station operations manager. "I do think he's bored," she says. "The first couple of interviews, I couldn't keep him from talking. The last time, he said, 'This is hard. It's like teaching someone backgammon.'"

Evan Jenkins

Steve Burns, left, interviews his informant, a coding clerk at a trucking company.

Others have similar complaints; Spradley counsels relaxation. "You have a long time," he says. "Ease up on it a little. Just listen; don't always focus in on the interview as an interview." At another point he asks a student whose informant seemed uncommunicative: "How often do you say, 'Gee, I never realized....' How often do you express your cultural ignorance and show your interest? Year after year, people go about their jobs and just don't think they're interesting. You've got to remember that they won't believe anyone is that interested. Keep them talking."

Several times, students offer advice. One member of the class is urged to get her informant to "a different scene," where work pressures would be off and conversation easier. For a student who is having trouble narrowing down his informant's areas of knowledge, the questions offered are, Which does he know best? Which does he like best?

Stuart Beechler took the course under Spradley last year—his informant was a waitress—and he remembers some rough spots. "It takes time to get the informant's confidence," he says. "She can't see why you're interested. What is there to being a waitress? It's amazing how much there is, but it's only after the second or third interview that it gets productive. And there are dry spells. Often you'll look over your transcript and see an obvious question you should have asked." On the whole, Stuart gives the course rave reviews. And he illustrates a number of the things McCurdy and Spradley believe Anthropology 30 can develop in students: increased self-confidence, more orderly thinking and information gathering, and an understanding of people.

Majoring in Spanish with a minor in political science, Stuart, a senior from Cleveland, spent seven months in Guatemala doing research on urban develop-

Learning experience:
Ethnographic Field Methods. Prerequisite: Introductory Cultural Anthropology. Enrollment: 20 to 50 annually.

Other descriptions:
James P. Spradley and David W. McCurdy, *The Cultural Experience: Ethnography in a Complex Society*. Chicago: Science Research Associates, 1972. (Includes sample ethnographies written by Macalester College students.) *Anthropology: The Cultural Perspective* (especially Chapters 1 and 3). New York: John Wiley & Sons, 1975.

Contact:
James P. Spradley or David W. McCurdy, Department of Anthropology, Macalester College, St. Paul, Minnesota 55105, (612) 647-6144 or 647-6381.

ment after he took the course. "I not only had a technique for getting information," he recalls, "I was able to put it into perspective—breaking things into categories, seeing relationships. It saves a lot of time and energy; you get at more, understand better, organize better, get over humps faster. I was dealing with a very different culture, too. The course was extremely helpful in understanding that it was *good* that it was very different, and that it shouldn't weird me out or intimidate me."

As the course progresses, students have to learn to be comfortable with the concepts of the language of ethnography itself, a tongue that includes such terms as taxonomy, paradigm, cultural domain, dimensions of contrast, componential analysis, and indeed the word "culture" as it is understood by McCurdy and Spradley. Of the many definitions anthropologists have offered over the years, the two men have chosen one that describes it as "the acquired knowledge that people use to interpret experience and to generate social behavior."

For example, according to Spradley, the tramp's knowledge of his complicated world is defined and organized by its rich language. "Bindle stiffs," among their other distinguishing characteristics, get from place to place on freight trains; "airedales" prefer walking. In an exhaustive study of these "urban nomads" in Seattle, Spradley learned enough of the language to determine that his informants knew of 15 different kinds of tramps. The language classified them not only by mode of travel but also by the way they made a livelihood (a "ding" asks for handouts), by home base (an airedale's is the pack he carries) and by degree of mobility (all but the "home guard tramp" move from town to town).

Similarly, Steve Burns in his third interview with Dave Peterson (not his real name; informants' identities are confidential) becomes familiar with such terms as "shag," for a small truck used in the inner city, "straight truck," for an even smaller vehicle used in tight places, and "photos," for photocopies of "bills" (bills of lading).

In each case, the investigator seeks to let the language of the culture come out in its fullness. It is important to avoid triggering the informant's "translation competence"—the tendency most people have when talking about their own specialized worlds to speak only in words and phrases they think the outsider can understand. Much detail and depth are lost in translation, according to the ethnographic semanticists, and they try to avoid it.

David McCurdy, left, and James Spradley alternate teaching ethnographic field methods that "restore some excitement to the learning process."

In the words of Paul Saltzman, a junior from Skokie, Illinois, and an enthusiastic alumnus of Anthropology 30: "You learn to be careful not to lead too much, though you have to direct the interview. If the guy says something that sounds important and then rambles, you say, 'Hey, you said something about X. Can you talk about that?' The person is going to tell you things he doesn't know he knows. It's always better to ask and be proven dumb than not to ask."

Stuart Beechler talked of the danger of the "What is—?" question. "You don't ask a waitress, 'What is a section?'" he says. "If you do, the information won't be extensive; she'll try to interpret for you. The answer will be too general, and you won't get at what she thinks. You want all that vocabulary for the inside perspective. So you say, 'What do you do in your section? How many sections are there? Are they all the same? What are the differences?' And it turns out that only two sections can handle large groups, that there's one called the Bermuda Triangle because for some reason it's the last to fill, and so on."

Spradley skirts the translation problem one morning as he videotapes model interviews for use in class. His informant is Brian Lotz, a freshman, and the culture involved is a steel and wood fabricating plant where Brian had worked. Among a host of things made at the plant, apparently, are "pins." Spradley acknowledges later that he doesn't know what "pins" are in this context, and he doesn't want to ask. "The meaning will emerge as my informant contrasts pins with all the other things they make," he says. "I can't ask him now because I can't know what something means in a full sense without knowing what it doesn't mean, what it contrasts with—paddle wheels, V blocks, flanges."

In listening to Brian discuss the plant's products, Spradley explores one of the culture's "domains." The word refers to any large category of a culture—the text says "any major subdivision of a group's acquired knowledge"—and the semantic relationship involved is inclusion. The point of discovering domains and listing their elements is to convey the way a culture is organized, as its members reveal the organization in their own terms.

One domain for Steve Burns in his study of Dave Peterson's trucking company might be "kinds of trucks." A taxonomy of the domain would include shags and straight trucks along with larger vehicles used for over-the-road

Sara Webb, a '76 graduate of Macalester, uses ethnographic methods in her work with the Minnesota Environmental Quality Council.

transport. The taxonomy would make no explicit distinction between shag and straight truck, though, and Steve has already discovered that the two are not identical. Just as Spradley discovers what "pins" are by contrasting them with things they are not, so Steve will come to distinguish between kinds of trucks by discovering the "dimensions of contrast" among them.

Finding out how components of a taxonomy resemble each other or differ requires a search for their attributes, a process called componential analysis. It can be just a series of "dumb" questions or it can be more complex. One method—triadic sorting—involves asking the informant to sort index cards on which the ethnographer has written some of the informant's terms.

Steve uses that approach with Peterson, in this case using 16 cards whose terms denote activities at work. Initially, Peterson tells him that all the cards seem the same. When Steve takes just 3 of the 16, however, and asks his informant to say which two are most alike, differences begin to emerge. "I do these two at the same time," says Peterson, placing two cards together and putting the other to one side. So Steve has one way of distinguishing between components of a domain—the times when different tasks are performed.

Attributes that reveal dimensions of contrast can be represented graphically in paradigms. One such paradigm appears in a remarkably detailed study, "Trash to Cash: An Ethnography of the Cultural Scene of Garbage Collectors," done last spring by Ulrike Linke, a German-born junior at Macalester. It lists the various pick-up systems used in the culture—roll-off, load-lugger, rear-end, and front-end—and their characteristics under five qualities—profitability, invoices, scheduled pick-ups, costs, and speed. Ulrike began the investigation of the world of garbage because in Germany trash collectors "are really looked down upon, the lowest of the low, and I didn't think that was fair." She is planning to develop her study further for an honors thesis.

Sara Webb, a member of the Macalester class of 1976, took four anthropology courses and wrote an interdisciplinary honors thesis—in geography, her major, and anthropology—on a neighborhood in Denmark. She used the methods taught by Spradley and McCurdy, and she continues to use them in her job as a land-use planner with the Minnesota Environmental Quality Council.

Her task is to determine potential impact on recreation of the proposed mining of nickel and copper near the Boundary Waters Canoe Area in northeastern Minnesota. She prepared a detailed proposal that convinced her bosses that the only feasible approach, given time and budget limitations, was to interview rangers and others who really knew the area—to get at their knowledge through ethnographic-semantics methods.

"I just couldn't go out there and sit and watch forever," she says. "The next best thing was to soak up someone else's knowledge. I was confident I'd be able to use the methods I got in these courses. And I'll sign my name to the results, which I wouldn't do if all I had to work with was a questionnaire or a lot of statistics from other agencies."

McCurdy speaks proudly about the large number of honors theses Anthropology 30 produces. Says Spradley, "When a student shows a 150-page, bound ethnographic thesis to a graduate school—wow!"

As a result of their efforts the two professors have gained a measure of renown in their discipline as innovators, and their texts are used in colleges around the country. They like to think they are partly responsible for an apparent trend toward more field work for undergraduates in anthropology. They complained last fall about a lack of material support from the Macalester administration—a situation that is being remedied, McCurdy reported recently—but had high praise for the school's academic standards and atmosphere. As McCurdy puts it: "The institution supports the freedom to innovate, and that's tremendously important."

Over lunch one day, the two men discussed the spiritual rewards of their approach to teaching. "There was the problem of kids turned off to book learning, and we thought we could restore some excitement to the learning process," said Spradley. "It was a way to restore our own excitement, too," McCurdy added. "The kids seemed to be saying, 'Turn us on, if you think you can, and we don't think you can.' Well, we're getting better stuff from freshmen and sophomores now than we got in some of the early senior honors theses." "It's much more exciting," says Spradley. "It makes you wonder how you got where you are, because you know the kids will pass you."

An outsider, after observing Steve Burns doing ethnography, remarked that he seemed to do it very well. "I've got an excellent model," Steve said. "I've never seen anyone interview as well as Spradley, and the method is an excellent way to get information." ■

PULLING IT ALL TOGETHER IN SENIOR SEMINAR

by Liva Baker

The catalogue description of Anthropology 491, a course required for all anthropology majors at the University of South Florida in Tampa, skirts the line between misleading and inaccurate: "A seminar approach to the integration of the fields of anthropology. Designed to help the student refocus on and come to a better understanding of the nature of anthropology." More appropriate might be something like this: "*Encounter* with anthropology. Designed to *demand* that the student come to a better understanding not only of his or her own discipline but of his or her own soul."

Offered each year in the winter and spring quarters with an average enrollment of 22 students per quarter, Anthropology 491 is better known on campus as senior seminar. In fact, its basic structure is that of the usual seminar: two two-hour class sessions each week combining lecture and student participation plus frequent individual conferences with the instructor, the whole culminating in an original paper on the nature of the entire field of anthropology. The purpose is to pull together all the seemingly disparate material offered in prior courses. Having analyzed the discipline and studied in depth its four component parts (physical anthropology, cultural anthropology, archeology, linguistics), the student must now synthesize, take an aerial view, and attempt to discover unity in this rich but infinitely diverse endowment—not a simple task in a discipline that reaches across all the fields of human scholarship and incorporates areas of the social, physical, and natural sciences.

Up to this point, senior seminar sounds not very dissimilar to many a comprehensive senior-level course designed to provide the capstone to a major, be that major English literature, constitutional law, or physics. What gives this course that extra dimension is personal involvement—of students, professor, and other members of the anthropology faculty who are invited to do guest spots. Texts are chosen, lectures planned, class discussions directed, and papers written, all with individual commitment as the main theme.

Take the paper, which counts for 40 percent of the grade. (An oral presentation of progress on the paper counts for 20 percent, an oral presentation of readings 20 percent, and class participation 20 percent.) The standard academic preliminaries are expected; the true-confessions approach is definitely out. But the paper is not only a scholarly essay on the nature of anthropology. It is, in addition, the student's own personal vision of his or her chosen field, his or her own attempt to create unity out of diversity.

"I think anthropology absolutely requires a combination, a careful combination, of one's personal and one's scholarly mind," explains the instructor, Gilbert Kushner, who is also department chairman, associate dean of the College of Social and Behavioral Sciences, and a passionate man himself on the subject of anthropology. "I think that's the essence of it all in anthropology—to feel, and be willing to feel, and at the same time be willing to temper that with scientific skepticism or vice versa. I think you've got to have both."

Kushner gives the first lectures, describing his own intellectual and emotional commitment to the discipline. Then some of the other 12 anthropology faculty members are asked to discuss their involvement with the discipline: how they were drawn into it, their decisions regarding specialization, their present commitments in the field.

Background reading is not a search for data but for the views of professional anthropologists regarding the nature of their field. The two texts—*Horizons of Anthropology* edited by S. Tax and L.G. Freeman, an anthology of comments on various special-interest fields within anthropology from the perspective of practitioners; and Eric R. Wolf's *Anthropology*, which is the author's own statement on the discipline—are supplemented by such works as Robin Fox's *Encounter with Anthropology*, Adam Kuper's *Anthropologists and Anthropology*, and Margaret Mead's "Towards a Human Science" (*Science*, March 5, 1976). Class discussion focuses on this reading and how it relates to the students' thinking as they develop their own statements. So that the kind of thing that more often happens—if it happens at all—spontaneously in the privacy of a professor's office or among intimates, at USF happens formally and publicly. The advantage at USF is removal of the element of chance.

"They *must* make a personal statement," says Kushner. "The statement is

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to be informed by the usual panoply of scholarly information. It doesn't have to be filled with citations as long as it's clear that they've read and understood and thought. I've got some stuff that resembles poetry. I've got some stuff that's very heavily footnoted and cited. What I want to do is enable them to have a personal encounter with the discipline that other courses, some that I've taken as a student, rarely really did."

Subjects of student papers are as infinitely varied as the students and their backgrounds. A middle-aged woman, who encountered "the long journey of man" in the tiny museum at Olduvai Gorge and returned home to enroll in the anthropology department at USF, writes of her own "journey into anthropology." Having concluded from her analysis of the discipline that "man's attempt to meet with man" has "led to a more emotional commitment to humanity," she writes: "There are special corners in our lives where we begin to discover ourselves and our place in creation. There are many such corners in childhood where we enter and leave a little older and a bit more aware.... Occasionally there is a rare encounter which raises the consciousness to a peak that transforms all past concepts, heightens the present experience, and gives new meaning to the future. Anthropology has been that kind of place to me."

Not all papers have such a mystical quality. One student became "fascinated" while working her way through college "by the hierarchical and political organizations of the large corporations I worked for," and had already finished a language diagram of ladies' wear departments for a linguistics course. She called her paper "Anthropology and American Business" and urged a marriage of the two. "As an anthropologist," she wrote, "I feel that a great deal of information and knowledge about social and economic behavior is denied the discipline as a whole by not studying the corporate organization." And an ROTC participant discussed in "Ethical Concerns in Cultural Anthropology" the potential for role conflict in having to function as both anthropologist and army officer.

Not all the soul searching is on the part of the students. Some guest lecturers from the anthropology faculty, who have never presented even to themselves their professional and personal statements of involvement, often articulate them here for the first time. And Kushner, who has been involved in anthropology since he was a City College of New York undergraduate in the 1950s and has been teaching this particular course since he came to USF in 1970, is forced to reinvestigate many of his own positions during each seminar.

Anthropology 491 is not the invention of one man, although Kushner brings to it a rare capacity for intensity and a kind of educated wonder. When he arrived at USF, the course was already part of the anthropology curriculum, one of several mod expressions of a rather mod university. Part of Florida's State University System, USF opened in 1960 to serve the surrounding predominantly urban population not only academically but socially and culturally. The University perceives its mission as applying "the talents of its scholars and students to the peculiar ills besetting modern society."

In addition to the usual components of the liberal arts program, USF's anthropology curriculum includes an Applied Anthropology Internship Project (funded by the National Institute of Mental Health) that supports a contemporary master's degree program; it encompasses urban anthropology, medical anthropology, and public archeology. There is also an undergraduate "focus in applied anthropology," which requires students to work on modern urban problems. (As yet there is no PhD program in anthropology, although Kushner says the department is "thinking about contemplating it.")

All these strains conspire to set some new trends for careers in anthropology. Traditionally, applied anthropology has been straitjacketed in applied social and cultural anthropology, and the usual training pigeonholed students into academic jobs. "From our perspective," Kushner says, "everything in anthropology is capable of being applied. We're focusing on getting persons trained and out into the world off campus into nonacademic occupations." One can "manage a brewery and still think in terms of an anthropological perspective," he adds.

If there are as yet no brewery managers among USF's anthropology graduates, there are plenty of departures from academic tradition: A young man whose first job with the county planning commission involved helping to formulate land use and reuse plans went on to become assistant to the director of zoning; an administrator and counselor with a local housing authority brought the anthropological perspective to the housing problems of the elderly, the handicapped, and families with low and moderate incomes; and a corporate ethnographer for Dun and Bradstreet undertook in-depth investigations for corporate clients who wanted to go beyond the usual credit ratings.

If enrollment figures are an indication of success, the USF anthropology department has discovered the secret of life. In this day of declining student numbers, its anthropology enrollments are up: The number of undergraduate majors increased 17.7 percent for 1976-77 over 1975-76; while total anthropology graduate students nationwide decreased slightly, USF's have risen 38.4 percent; MAs awarded increased 333.3 percent while totals nationwide rose by only 3 percent; BAs awarded rose 15.7 percent while those totals across the country dropped 11 percent.

And Anthropology 491 solves what Kushner considers a significant academic problem: Inundated by waves of information and drawn into increasingly specialized areas of the discipline, students fail to pull together either the subject matter or their own involvement in it. The senior seminar approach not only *can* be adapted to an English literature or physics concentration, but, indeed

Learning experience:
Senior seminar in anthropology. Prerequisite: major in anthropology. Enrollment: 10 to 29, average 22.

Other descriptions:
Materials such as the following in which anthropologists contemplate their own and others' images of anthropology have been helpful to students:

Eric R. Wolf, *Anthropology*. New York: Norton, 1974.

Dell Hymes, ed., *Reinventing Anthropology*. New York: Vintage Books, 1974.

M.P. Redfield, ed., *Human Nature and the Study of Society—The Social Uses of Social Science*, Vols. I and II of the papers of Robert Redfield. Chicago: University of Chicago Press, 1962 and 1963.

S. Tax and L.G. Freeman, eds., *Horizons of Anthropology*, 2nd edition. Chicago: Aldine Publishing Co., 1977.

Berreman, Gjessing, and Gough, "Social Responsibilities Symposium," *Current Anthropology* 9, No. 5, pp. 391-436.

R.N. Adams, "The Problem of Unity and Diversity in Anthropology," *American Anthropologist* 79, No. 2, pp. 263-264.

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Tom Boyle

Students discuss their personal visions of anthropology with Gilbert Kushner (left).

Kushner declares, "*ought* to be present in every major curriculum at a university or college."

Is there a tendency among some students to replace substance with verbiage, to talk to hear themselves talk? Rarely, says Kushner. "I seriously view 491 as a place for Truth with a capital T, a place for serious and profound Truth at that moment. Sometimes a student will say something not necessarily so well but so passionately." The choice of a major, he adds, "has somewhere to involve some passion. It's an experience that I think all human beings should have. What I really try to do in senior seminar is discover that spark and fan it into a goddamn bonfire."

Appropriately enough for a course demanding personal involvement, senior seminar's center of gravity is determined by the weight of both students' and instructor's desires and interests. A preponderance of linguistics students may be able to shift the emphasis away from physical anthropology and vice versa. Student dissatisfaction with the texts has prompted Kushner to alter some of the reading requirements. He is working up an expanded list of books and articles covering the four branches of the discipline—to which he has asked other anthropology faculty members to contribute. Instead of having every student read the same material, everybody will now be reading different material and reporting on it, and out of this exchange a total picture should emerge. "I'm not terribly convinced that that's going to work," Kushner adds, "but who knows. I'll give it a shot. Maybe this will encourage more people to read more."

On the other hand, a student-suggested structural change has met with less enthusiasm. During the last class session, when analysis of the senior seminar itself is the traditional subject of discussion, students asked that 491 be given in two parts—first on a lower

Probing the Methods of the Professional

At Pennsylvania State University, Anthropology 1 was once a survey course like many others. Students sat together in lectures or separately before video screens and tried to assimilate two or three semesters of information in 10 weeks. Neither instructional mode made it very clear to students why anyone bothered to study anthropology. Neither had a clearly defined function as part of the student's overall education. Motivation was low and there was little student interest in pursuing anthropological studies beyond the introduction.

Faculty dissatisfaction with this situation led to an examination of the very concept of an introductory course. Generally, the student is an outsider looking in. The Penn State faculty felt that interest would be enhanced if the student could somehow be brought inside the field of anthropology. And it was determined that the best way to do this was to present anthropology to the student as it is seen by the anthropologist.

The course approach was changed so as to acquaint the student primarily with the kinds of questions asked by working anthropologists. Warren T. Morrill, head of the Penn State anthropology department, has a simple and persuasive rationale for this tactic: "If we can introduce the student to the kinds of questions asked by anthropologists—and those not asked by them—then we can indicate the general nature of the discipline. We want to teach the student how to identify the things that interest the anthropologist. And we want the student to learn how the anthropologist goes about studying the items of interest. In this way, the student will learn the basic concepts and methods of anthropology and assimilate some of the information acquired through their application."

To accomplish its newly formed objectives the department did away with the traditional textbook for some of its introductory sections, substituting a book of readings assembled by the faculty. Eight papers gathered from the professional literature were included, along with one written especially for the new course. The professional papers covered a wide range of anthropological inquiry but shared some critical features: Each explained clearly how the anthropologist had chosen the areas for investigation and how he had proceeded in his research. The papers also discussed setbacks the scientists suffered, how they coped with them, and how the research work was modified along the way.

Department faculty prepared study guides for the readings, each providing some historical background, definitions of technical terms, and elaboration of important concepts. Each guide also incorporated a series of study questions. In addition, a videotape cassette was provided for each reading, to show the environ-

level, as a kind of preview of the discipline, and second as the wrap-up of the major that it now is. Kushner explained that not only would this cut into already tight scheduling, but he doubted the value of such a course "until they've had whatever the curriculum is. They won't have the capacity to wonder. It takes a while even at the beginning of the course until they really understand what's involved."

Not that senior seminar is an unqualified success. One serious shortcoming has universal application to students; another applies more typically to courses of this kind: The first concerns student reluctance to make deeply felt personal statements. "Some folks maybe have never done this kind of thing," explains Kushner, "except with a couple of significant others in their lives. It's not always the easiest thing to do. Some people resist it. Some people are uncomfortable really opening themselves before others, and some people never acquire that ability in the course and maybe in their lives."

For which Kushner's antidote is loosening-up exercises. Although at one time he considered such devices beneath his professorial dignity, he has come to rely on them regularly. He begins at the first seminar meeting. Using one technique Kushner divides the students into groups of four or five, gives them a series of items of information they must discover about one another—name, class, interests in anthropology, etc.--then leaves the room; when he returns, each student reports his or her findings, and discussion proceeds in an increasingly relaxed manner.

A corollary to students' reluctance to open up is their unwillingness to disagree with academic authority, an unwillingness Kushner often finds difficult to overcome. He expends a good deal of time and energy trying to convince them he does not want carbon copies of himself, that the essence of teaching is to "develop students who really differ with the master."

The second serious shortcoming of senior seminar is indigenous to the enterprise itself: a scarcity of texts. There "used to be a rather general consensus that for some reason you didn't talk about, you didn't write about what happened to you as a person in the course of being an anthropologist," explains Kushner, so that until recently the major figures in anthropology described their encounters with the worlds around them but rarely the worlds inside them, and personally revealing statements are scarce.

Student evaluations of Anthropology 491 tend to run at or above the college norm in such areas as clarity of course objectives; appropriateness of content; and the instructor's ability, preparation, and interest in students. If they see a fault, it may be the very passion—labeled dominance by some—that Kushner brings to the seminar, an inevitable consequence whenever an intense individual seeks to elicit a highly charged response from others.

Many students, however, find the instructor "stimulating," or "inspiring," or some variation thereof, and believe that senior seminar has generally achieved what was intended. Says one Anthropology 491 veteran, now a graduate student: "This is where you get to sit back and sort out all this inundation of data that's been thrown at you and say, I know all this, what does it actually mean to me? It starts a sifting out in your mind as to the direction you really can take. As far as I was concerned, the course continued on far beyond the final grade—I'm still sifting out where I'm going, but that was what set it off." Which is, after all, what Anthropology 491 is all about. ■

ment of the subjects under study and to display the instruments and techniques of research. The videotapes were also accompanied by specially prepared study guides.

Each student in the course is provided with the book of readings and the study guides, separate study guides for the videotapes, and a tutor who can be telephoned at specified times. At other times the student has access to a general tutorial staff that mans the phones. When no tutors are available an answering service records the student's question and a tutor returns the call. The student may request tutorial assistance at any time, irrespective of his progress in the course, but is required to do so if his performance falls below certain criteria.

Testing is done after the completion of each unit, which consists of one reading and its related audiovisual program. The student may take a retest if he is not satisfied with the results and/or may consult a tutor who will conduct a question-by-question analysis of the examination, explaining areas of apparent confusion and providing references to the study materials.

The intensive tutoring requirements of this approach call for a large number of graduate assistants, but feasibility is enhanced by the fact that there is considerably less direct faculty involvement than in the traditional introductory sections. Once format and content have been established, the program is self-sustaining, and faculty participation can be minimal without sacrificing educational goals or quality.

This point is substantiated by the responses of students to the new course. Enrollments have increased each term since the inception of the program, and student evaluations have been generally favorable. And while there are a number of students each term who transfer from the traditional lecture sections into the new individualized sections, there is very little movement in the other direction.

Additionally, students in the new sections, who are tested as they complete each unit of study, perform considerably better on the final examination than their peers in the traditional sections, who are tested only once or twice during the term. Thus, dividing the course into discrete functional units, with frequent testing, seems to enhance retention as well as comprehension of the material. At Penn State, the new approach to Anthropology 1 is considered an unqualified success. As Morrill puts it, "More students learn more and more, enjoy the course more, and it costs less to teach them." What else, after all, can an instructional staff ask for?

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Building an Understanding of Human Adaptability

Turn 15 upper-level anthropology students out into the 6-acre field behind your house and pronounce it a closed environment for building a wigwam. Provide an eighteenth-century design and supervise while students gather straw and black birch saplings, keeping a list of resources and the time spent collecting and preparing them. Divide the class into two groups and have each group pass a couple of winter nights in the finished hut. This is the way Brooke Thomas, associate professor of anthropology at the University of Massachusetts at Amherst, makes students experience how a population functions in response to environmental stresses and scarce resources.

"Anthropology too often consists of simpleminded answers to narrow questions," Thomas says. "Students learn to concentrate on a single factor and pretend the others aren't there." Convinced also that "our teaching is too descriptive—our failure to go out and perform tests has led us to reword the same written information year after year," Thomas developed the Human Adaptability course that features the wigwam experience. In 1974 he brought it to the University of Massachusetts; experimentation figures heavily in the physical anthropology program there, and the atmosphere was ideal. The course is not required, nor is it restricted to anthropology majors; about half the department's juniors and seniors and most of its graduate students enroll.

"Beginning the course with this project builds class rapport immediately," Thomas explains, "because students have to help each other carry loads of straw and so forth. I don't organize—I just let leadership develop as it will in any society so they can see the basis for division of labor. In the tasks they perform they naturally sort themselves in terms of competence, and eventually more efficient methods evolve. As one person hits on a new technique—pulling out grass sideways, for instance—it spreads through the group and by the end of the day everybody's doing it. This illustrates the energetic consequences of information exchange. Of course they've learned such theory in class, but here they can observe it happening. Surprisingly, women often fall into the gathering role while the men supervise and direct."

Students then go back to the lab and use their data to calculate time and energy costs. When all expenditures are totaled and students realize how inefficient they've been, Thomas may have them repeat a task using a tool—cutting straw with a sickle, for instance—to further their understanding of the ways these methods developed.

In mid-February students spend a night or two in the wigwam to study cold stress. They measure temperature and wind velocity in different areas of the field to determine whether they've chosen the best spot for the hut ("They usually haven't," Thomas confides). Inside, after building a fire, they attach thermometers to the ceiling, sides, and floor to find out how much the outside temperature is modified by the shelter and the energy source.

One or two students wear thermal probes—thermometers with long wires attached to a readout box—on the forehead, chest, fingers, toes, and in the rectum or armpit. By comparing these temperatures with similar readings taken inside Thomas's house, students learn how much energy is lost in the body's effort to maintain a constant temperature. "They also see that responses to cold must be energy efficient," Thomas says. "Grass burns warmer than wood, but they have to collect so much and feed it into the fire so often that they conclude layers of clothing are a more effective way to stay comfortable." Preparing a meal of stew or gruel over the fire and measuring its effect on body temperature is another activity. And Thomas is receptive to students' ideas: One slept with a dog and found it an excellent way to keep warm.

Thomas constantly reminds his classes not to rely on data accumulated in a day or two of measuring the environment; he stresses that the wigwam experience is merely illustrative. When a question of accuracy arises, he and his students try to simulate the situation in the lab and make more controlled measurements. A work/study student from another department is now building a "cold chamber" in the lab: Plywood and sheetrock form the other two walls in a corner where there happens to be an air-conditioner. "An open window would also do," Thomas adds. "I try to minimize expense. Most equipment needed for this course can be afforded on small grants, and you can improvise and still get accuracy."

Research projects abound throughout the physical anthropology curriculum and there is tremendous administrative support. "Even though cutbacks are in force," notes associate professor George Armelagos, "the administration does all it can to maintain our program." Another student favorite is Alan Swedlund's Demographic Anthropology course. In one of Swedlund's exercises, students take data from local cemeteries and scrutinize town records for explanations of high birth and death rates. Trying to determine whether fire-and-brimstone revivalist Jonathan Edwards had an effect on tombstone design in Northampton in the 1700s, one class discovered that during his period of influence the illegitimate birth rate dropped.

How do students feel about the research? "They tell me it completely reorients their thinking about how to approach questions," Armelagos reports. "This is a state university and many students from local high schools have never done an independent project. It blows their minds when they realize they can test situations they've always had to rely on the literature for. I was skeptical when Brooke first proposed exercises like gathering acorns. But the excitement and discussions that grow out of these activities are incredible."

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Education and Controversy: The Same Side of the Same Coin

Students enrolled in M.H. Crawford's introductory biological anthropology course at the University of Kansas are warned on the first day of the semester that Crawford is not going to tell them the truth. Rather, his aim is to convince them that in science there is no truth: There are only theories, some more probable than others but few so well established that they can be considered incontrovertible fact. In a departure from standard introductory course protocol, Crawford has declined for the past several years to spoon-feed his undergraduates morsels culled from decades of scientific debate and pass them off as facts. Instead he recreates the debates and lets students decide what truths they wish to take away with them.

Crawford's course, Controversies in the Living and the Dead, consists of a semester-long review of those issues that have roused biological anthropologists' passions over the last few decades. Just as there are two sides to every coin, he tells his students, so are there two interpretations—and sometimes more—for every piece of data anthropologists have accumulated. Intrinsically, each interpretation is as valid as the next; only when a vast array of data are studied can any overwhelming probabilities, or truths, be distilled. He guides his students through a methodical inspection of the two sides of a dozen anthropological coins, teaching them a good deal of anthropology and also a good deal about the theory of probability on which all of modern science is based.

Crawford devotes the first two weeks of the course to a review of evolutionary theory, giving his students a background from which they can approach the rest of the material. Each of the ensuing 10 weeks is set aside for a step-by-step examination of an anthropological controversy, one which may well be raging in scholarly journals even as the students discuss it. In the week's first 90-minute session Crawford delivers a lecture describing the subject of the controversy, reviewing the historical context in which it arose, and detailing the major arguments it provoked. Students are then dispatched to read these arguments for themselves, and at the next session the floor is thrown open to members of the class. Crawford moderates a point-by-point review of the evidence for and against the conflicting theories and leads the class in forming an opinion.

Students discover that controversy has punctuated every aspect of biological anthropology, from the earliest fossil studies to the most recent excursions into man's genetic makeup. Crawford has tried to keep a balance in the controversies he offers between those involving twentieth-century man (the living) and those relating to his ancestors (the dead). The class attempts to pinpoint the date at which the pongids and the hominids diverged, but students also consider the pros and cons of genetic engineering; they discuss the mechanisms by which races originated, but they also weigh the proposal that there is a racial basis to modern man's intelligence. Crawford has revised his syllabus several times since he first offered the course in 1974 to make room for such recent developments as sociobiology.

Although two major conflicting opinions usually constitute the backbone of each controversy, Crawford tries to introduce other points of view into the arena. The students begin to realize that anthropology, like any science, is not a matter of right and wrong, but of most likely and least likely. Given the evidence, they can see that the pongids and the hominids more likely diverged 25 million years ago than 10—that the paleontological evidence for the former is more probably correct than the immunochemical evidence for the latter. But even as they find for one or another of the opposing sides at the end of each discussion, students become increasingly sensitized to the very slender thread of evidence from which an entire web of theoretical reasoning can hang. Anthropology emerges for them not as a static mass of knowledge, but as a collection of constantly shifting perspectives.

Crawford's course, which has no prerequisites, has attracted a wide variety of students at the University of Kansas and has elicited a positive response from all of them. End-of-semester evaluations have invariably placed it in the most popular 10 percent of all courses offered at the University, irrespective of the final project, which has varied from a paper to a test to an oral exam over the years, and the class size (Crawford has worked with as many as 60 students and as few as 15). Students appreciate the opportunity to work with a discipline, rather than simply inhale its facts, as so many introductory courses require. If the course is the beginning of a long involvement with anthropology, it provides them with a sophistication on which to base the rest of their education. And even if it is the last anthropology course they take, they carry with them the technique of learning by dialectic.

Crawford has been spreading the gospel of controversy too: A book in which 10 controversies are presented as they are in his class, with reading selections and interpolated discussion, is now in its final prepublication stages. In addition, his colleague David Frayer has successfully taught the course at the University of Kansas, and several of Crawford's students are now teaching their own versions of it at universities across the country. From readers and reviewers of Crawford's manuscript, from his students, from his colleague's students, and his students' students, a great deal of enthusiastic congratulation has been making its way back to Crawford. It seems evident to him that in anthropology, and quite probably in such disciplines as philosophy and psychology as well, education and controversy are the same side of the same coin.

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Keeping Them on the Right TRAC

At one time in American higher education, students at many colleges and universities complained of stringent course selection requirements. Too many decisions had been made for the student by those who presumably knew best, and the resulting restrictions often produced resentment. As course selection became more flexible, an understandable rebound reaction often set in: Students enrolled in free-form programs sometimes found themselves foundering in a sea of enticing but unknown course offerings, not being able to do much more than merely stay afloat.

At the University of Washington in Seattle, anthropology students are confronted by only 15 credits of required courses in their major. This clearly provides maximum opportunity for the student to individualize his or her program of study. But departmental staff are keenly aware that without guidelines, the advantages of this flexibility could be very easily lost. Uninformed decision making or insufficient planning on the part of the student could more than make up for the benefits afforded by the lifting of burdensome course requirements.

To deal with this potential problem, anthropology department staff have compiled a comprehensive handbook for their undergraduates. An inexpensively produced, staple-bound document of 19 pages, the handbook features guidelines for "tailored, relevant anthropology course sequences" (TRACS). The rationale is clearly stated at the outset: "The key to successful careers with an anthropology BA is course selection."

Aware that only a minority of anthropology majors intend to continue anthropological study at the graduate level, the department has put together a wide array of course selections and sequences intended to suit an equally wide array of student needs. Many undergraduate anthropology majors, for example, go on to careers in law, medicine, dentistry, education, social work, public affairs, and urban planning. Filling the needs of such students as well as of those who would be continuing in specialized areas of anthropological study required a careful assembling of available courses from both within and outside the department.

In devising the handbook, the department's undergraduate advisor, David H. Spain, acted on the principle that "most undergraduate majors are seeking a solid, stimulating liberal arts program—something with the breadth of history, the roots of biology, the precision of psychology, and the relevance of economics." Spain believes that anthropology can meet these requirements, and he has designed the handbook to help ensure that it will, whatever field of work or study the student may have in mind for the future.

The handbook consists primarily of the TRACS themselves: courses put together to satisfy student needs in particular areas of study. There are, for example, preprofessional TRACS in four areas: prelaw/public affairs, premedicine/dentistry, presocial work, and prebusiness. Each leads to a BA in anthropology while also preparing the student for entrance into the designated professional school. And while drawing extensively from a pool of courses in physical and cultural anthropology, the various preprofessional TRACS also include offerings from such other areas as history, political science, economics, sociology, psychology, physiology, and communications.

For students in physical anthropology there are two separate TRACS to choose from, while those pursuing archeology have a choice of four TRACS representing different areas of interest. Sociocultural anthropology, comprising social, cultural, and formal anthropology, offers the widest array of TRACS, including sequences for specialization in religion, art and aesthetics, politics and law, and museology. These latter TRACS draw upon course offerings from many departments, including art, music, drama, philosophy, education, and engineering.

Much as a perceptive advisor might, the handbook also dispenses explanations and advice on matters running the gamut from mundane to metaphysical, the sort of information students are too often presumed to know. There is a section on "Anthropology as a Major," which describes the goals of anthropology, its relevance to careers, and the various programs available. "How to be an Anthropology Major" discusses the requirements for and mechanics of admission and graduation. In "Departmental Resources" students learn about the department's library, an ethnographic data storage system, a local museum in which physical anthropology and archeology faculty maintain laboratories that can be used by advanced students, and the University's institutes and centers that are affiliated with the department. Touching on professional ethics, the handbook asserts that "anyone who purports to be doing anthropology, from undergraduate class projects to professional research, should be familiar with ethical concerns," and summarizes the American Anthropological Association's "Statements on Ethics."

As compendious as the handbook may seem to be, it emphasizes that the TRACS are intended merely to illustrate some of the directions to go in anthropology. New TRACS are continually being devised in response to undergraduate needs, and students are urged to consult departmental advisors for the development of personal TRACS that will enable them to reap maximum rewards from their studies. To facilitate this process a specially prepared planning sheet is appended to the handbook.

Clearly, innovation lies not merely in the development of new teaching resources but also in the creative use of materials and courses already at hand. And therein lies the value of the handbook. By studying the TRACS, consulting an advisor, and paying careful attention to the planning sheet, the anthropology major can derive optimal benefit from the offerings not only of his department but of the university as a whole.

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Experiencing Ethnohistory

Four times during the past six years a group of undergraduates enrolled at The Colorado College have packed their bags at the start of a session and, accompanied by assistant professor of anthropology Marianne Stoller, set out for Santa Fe. Their month-long sojourn in the Southwest constitutes one of the College's most popular courses, an introduction to ethnohistory that allows undergraduates to get practical field experience as part of their regular coursework. Made possible by the College's unique educational philosophy, it is an opportunity deemed invaluable by students and faculty alike.

In 1970, The Colorado College undertook a radical experiment with the structure of its calendar, replacing a traditional semester-based plan with an academic year divided into nine blocks of three and a half weeks. During each block students take and faculty members teach only one course—but that course is an intensive daily involvement with the subject matter that more than covers a standard semester's worth of material. The pedagogical pros and cons of The Colorado College plan are still being widely debated, but the advantage this kind of calendar holds for disciplines such as biology, geology, and anthropology has been evident from the start. Professors need not consider students' other commitments as they try to work field trips into their syllabi. For one or two months the students are theirs alone —and field trips lasting a week or even a month are no longer impossible dreams.

The department of anthropology at The Colorado College has made particularly wide use of the prerogatives this calendar system allows. Several departmental courses include field trips of five to ten days; in addition, four "field courses" are available for undergraduates: a course in basic archaeology that transports students to sites in southeastern Colorado for a month; a course in ethnographic field methods that immerses them in the campus city of Colorado Springs; an advanced primatology course whose "field" is the local Cheyenne Mountain Zoo; and the ambitious Ethnohistory of the Southwest course, during which students research the area around Santa Fe for a two-block period.

The enthnohistory course was created as a part of the College's Southwestern Studies Program, an amalgam of courses probing the history, literature, and geography of the American Southwest that was conceived in 1971 and organized with a grant from the National Endowment for the Humanities. The course reflects the philosophy of the program: that the campus's location on the fringe of the Southwest is an educational opportunity not to be ignored. Not only does the area constitute a discrete and accessible microcosm for interdisciplinary work—it also lends these studies a relevance they all too often lack. Students embarking on their month-long exploration of New Mexico's enthnohistory are repeatedly impressed with the fact that scholarly research can be of public benefit; or, as Stoller puts it, that "as fledgling students *of* humanity they have a responsibility *to* humanity."

During the first week of the course this responsibility is temporarily suspended as students learn the basics of ethnohistory and the history of the Southwest on campus. The class then moves to Santa Fe, where students settle into a local motel (they pay for room and board; transportation comes out of the department budget) and spend a day of orientation at local museums, archives, and historical societies. Only then do they attack the questions that will occupy them for the next six weeks.

The problems they investigate in groups of two or three have been set up by Stoller in conjunction with Myra Jenkins, the state historian of New Mexico, but they are far from predigested morsels of play research: They are bits and pieces from the State Historical Preservation Commission's own roster of basic investigative tasks. Generally students are dispatched to research a village, community, or stretch of land suspected to hold historical significance. Using contacts Stoller has accumulated over the years, they take oral histories from local inhabitants and pore over legal documents, church records, maps, census figures, and anything else that will help create a picture of the civilization that grew in their area. It is, Stoller admits, "a nasty kind of research, plodding and painstaking, but it has to be done." For the students, their contribution to the world of scholarship and to the people of the area is demanding, infuriating, and, invariably, enjoyable.

After a month in Santa Fe students return to campus to spend two weeks analyzing their data and conclusions in papers that range from 50 to 250 pages. One copy of each paper goes to the local contact, another to the state archives in Santa Fe. And on several occasions a third has gone to a New Mexico courthouse to serve as evidence in hearings regarding the historical status of the land. Research done by Stoller's students has been used by a village seeking status as a national historical area, cited in the settlement of a land-grant claim, and gratefully appropriated by a town seeking funds for the restoration of a church and a ruined plaza.

Students are generally intrigued by their research—but they are simply entranced when the product of their own or one of their peers' labors goes on to have some tangible effect. The intoxication of putting academic skills to practical use has impelled several alumni of Stoller's course to return to New Mexico again and again, some to research honors theses and others to do graduate or professional work. The aspect of the course most praised on evaluations, says Stoller, is the incontrovertible proof it offers that "anthropological problems are real problems worth serious attention, involvement, and respect." Though it imposes a demanding workload that often occasions some griping, many students have labeled the course "the most rewarding thing I did in college."

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FOREIGN LANGUAGES

COLLEGE AND UNIVERSITY FOREIGN LANGUAGE PROGRAMS–NEW FORMS, NEW EMPHASES, NEW CONTENT

by Howard B. Altman and Richard I. Brod

As the pendulum of American undergraduate education has swung between the structured core curriculum and the open elective system, the place of foreign language study has shifted correspondingly. Historically, language study has been affected by most of the major movements that have influenced U.S. education: the English collegiate tradition, the cultural/intellectual dominance of Western Europe, the anti-German reaction brought on by World War I, the isolationism of the 1930s, the Cold War, the post-Sputnik boom, and the unrest of the late 1960s. With the changing styles, language preferences have shifted: The hegemony of Latin and Greek gave way to the elite languages of European culture (French) and science (German), which in turn have yielded to America's second language, Spanish. Russian, Chinese, and the languages of ethnic identification (Italian, Hebrew, and others) have been the subjects of new surges of interest.

Teachers of foreign language, literature, and civilization would prefer not to be treated as foreigners. Mostly American born, they enjoy polyglot colleagues and the occasional pleasant perquisite of study and travel abroad. They rightly see their discipline as central, not peripheral, to American education—as an integral part of the total curriculum and not merely a service function. To define the curricular role of foreign language study requires some reflection; indeed, it presupposes the development of a philosophy of education—something not every teacher or administrator has had the leisure to do. Among language departments, periods of expansion have encouraged depth, while periods of contraction have generated a remarkable curricular inventiveness and willingness to adapt a centuries-old discipline to the rapidly shifting interests of students, often in nontraditional settings.

The past decade has seen a vast number of changes in college and university foreign language programs. Some of these reflect new directions for departments and their curricula. Some are matters of form; others are matters of emphasis; and still others are changes in content, a redefinition of the substance of foreign language teaching and learning. The major curricular reforms include the following:

Temporal rearrangements. These include modifications of the academic calendar. In foreign language departments such modifications are labeled minicourses, weekend language retreats, immersion courses, intensive courses, and the like. In each case the traditional temporal bounds of the curriculum are altered; either the length of the course is changed or the number of daily contact hours increased.

Spatial rearrangements. An array of off-campus experiences fall under this heading, including study-abroad programs, language camps, and junior-year-abroad programs. Many institutions are also drawing on community populations and resources as the locus for foreign language learning. In each case the curriculum is taught in a setting other than the traditionally furnished foreign language classroom.

Modifications of class size. Changes in the traditional whole-class concept of foreign language teaching are reflected in individualized language programs, small-group conversation practice, or multisection lectures coupled with individual or small-group

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tutorials and practice sessions. Groups may be formed on the basis of aptitude, interests, or needs.

Interdisciplinary study. These changes in foreign language programs include the teaching of history or biology in a language other than English, business-oriented language courses, seminars such as The Theme of War as Viewed in Art, Music, and Literature, ethnic studies with foreign languages, and the like.

Media-based curricula. Experimentation with media abounds in foreign language programs. Computer-based, computer-managed, and computer-assisted foreign language courses have been described in the literature for the last decade, and despite the prediction that the language laboratory is becoming our profession's Edsel, institutions of higher learning continue to purchase equipment and install laboratory facilities.

Modifications of rewards. In foreign language departments, as elsewhere in academe, there have been changes in the evaluating and grading of student performance. Some institutions have done away with failing grades (and subsequently some of those have reinstated them); some faculty have switched to criterion-referenced testing and grading procedures. Variable credit systems have become a way of life in many individualized foreign language programs, and student contracts are used in some programs, allowing a student to contract in advance for a specified letter grade and an agreed upon amount of credit.

What these curricular reforms amount to is the flexing of the hitherto rather rigid definitions and parameters of the foreign language curriculum. The lock on the lockstep curriculum has weakened or given way in many programs; student-centered curricula, humanized instruction, personalized and individualized learning—these and other shibboleths of today have become realities in a growing number of language departments. New curricula have developed to meet local needs and interests, only to be replaced by even newer curricula as these needs and interests change.

Three of the most visible new directions for foreign language departments have been career-oriented language study, language teaching for special purposes, and individualization in various forms. The American Council on the Teaching of Foreign Languages and the Association of Departments of Foreign Languages have published materials and conducted workshops on aspects of career education in the foreign language curriculum with significant participation by college and university foreign language faculty. The career focus is not seen as a replacement for more traditional literary and cultural pursuits; rather, it is an alternative, an option designed to attract those students to foreign language departments who might otherwise fail to appear, and an incentive—through the development of greater proficiency—to retain those students who might otherwise abandon study after only minimal exposure. As such it is a significant new direction for college and university language departments, and the interest in career-related curricula is growing daily.

In fact, career-oriented language courses constitute one large area of a larger and rapidly growing category of language teaching for special purposes. Of the nearly 1,700 innovative courses listed in a recent survey conducted by the Modern Language Association, over 40 percent fell into this category, with course titles ranging from Spanish for Farm and Ranch Workers to French for Architects, Italian for Singers, and Russian for Travelers. A recent article on a course entitled Applied Spanish for the Social Services describes its growth in three years from one to seven sections.

In any discussion of new curricular forms the phenomenon of individualized foreign language programs looms large. Despite the claim of some that individualization has proven to be a fad and is now dying, the facts support a different conclusion, especially in college and university language departments. In fact, over the past half-dozen years individualized programs have taken on new dimensions from those found in the literature of the late 1960s. Institutions continue to experiment with flexibly paced instruction, with curricula catering to diverse learning styles and sense modality preferences, and with variable credit, mastery learning, performance objectives, and the like. The results in many programs have been quite gratifying, and there is mounting evidence to support real cognitive gain in these programs as compared with so-called "traditional" language programs.

Another new curricular form that has been popularized in recent years is the minicourse. Minicourses, as the name suggests, are reductions in both content and length as compared with conventional courses. They focus on a narrower theme—often one designed to appeal to a specific clientele. In this era of demand for instant gratification from one's efforts, minicourses offer the learner a more concentrated and focused opportunity and one which, should it prove to be not what the learner had in mind, has the added benefit of ending after only seven weeks.

Like other disciplines, the foreign languages have changed with the times, developing new emphases and approaches to meet newly defined functions in society. In 1978 their function may well be defined at the federal level: Moved by evidence of declining interest in language study, and concerned about the nation's record of compliance with the cultural exchange provisions of the 1975 Helsinki Agreement, President Carter has agreed to appoint a short-term Presidential commission to review needs and priorities for the study of languages and cultures in the United States. The result may be not only a critically needed national language policy, but a reaffirmation of the value of this uniquely rewarding humanistic discipline. □

ALL THE CLASS A STAGE

by Stan Luxenberg

His face red with rage and dripping with sweat, John Rassias hurled a chair across the small room where it crashed to the ground and the seat cracked. Screaming, as if in pain, Rassias tore at his shirt, popping the top two buttons and ripping the sleeve almost in half. Then he paused and smiled. The dozen college professors who had been watching him burst into applause. They had just received their first lesson in the Dartmouth Intensive Language Instruction Model.

More and more in the last several years, people from across the country have been making the trek to Hanover, New Hampshire, to observe Rassias, professor of Romance languages and literature at Dartmouth College. They come partly out of curiosity, but mainly because they have heard that the program designed by Rassias works. While most students wage losing battles in language classrooms, Dartmouth undergraduates are learning more quickly than they ever thought possible.

From 1972-73 to 1975-76, the introductory-level enrollment grew in Spanish from 203 to 225, in German from 201 to 280, in Italian from 44 to 75, and in French from 275 to 435. And the number of students majoring in French has grown steadily from 23 in 1966-67 to 90 in 1977-78. "We're very proud of our language programs," notes Fred Berthold, associate dean of faculty for humanities. "We have so many students in the language programs that we've come very close to the limits of the number we can handle."

Rassias developed his method during the mid-1960s, when schools around the country were beginning to recognize weaknesses in their language offerings. Spurred by the Soviets' Sputnik success, many institutions had beefed up their language sequences in the early 1960s, relying heavily on expensive laboratories. But over the next decade it became painfully apparent that most students were not learning languages and that they were finding the exposure frustrating. Some universities dropped language requirements altogether.

While teaching crash courses in French for Peace Corps volunteers, Rassias grew concerned about the failure of language programs. He came to believe that a second tongue could be taught best by instilling a desire in the student to communicate in a given language. To do that a teacher had to show, by his energy and concern in class, that he was convinced of the subject's importance. Many students were reluctant to speak in the foreign language because they were afraid of making mistakes. Rassias thought that by bringing out the uninhibited child in his students it would be possible to encourage them to freely use the language and learn it more quickly. "First you have to secure an emotional reaction," Rassias explained. "To do that I will go to any extreme."

Rassias's exploits in the language classroom are legendary at Dartmouth. Besides smashing furniture to emphasize a point, he frequently comes to class dressed like characters in the literature he is teaching. At various times he has bombarded his students with eggs, firecrackers, and raw meat. In one class, students began showing up wearing raincoats.

While other Dartmouth professors are less demonstrative, the Rassias techniques have been adopted in all Dartmouth's introductory courses: French, German, Italian, Modern Greek, Portuguese, Rumanian, Russian, and Spanish. The method basically combines fast-paced, intensive language drills with elements of drama. Students have two hours of class each day and one hour in the language lab. Although this totals 15 hours a week, students do not consider the load excessive because there is little homework; they learn the language by using it.

In the first hour of each lesson, professors—called master teachers—present exercises and basic dialogues from the textbook to groups of 20 to 22 students. English is rarely spoken. Professors introduce new words by dramatizing them. After the master class, the students break into groups of approximately 10 for hour-long drill sessions run by undergraduate apprentice teachers (ATs). The ATs represent the most innovative aspect of the Dartmouth method, and they are responsible for much of its success. ATs relieve the professors of much of the responsibility for conducting the drills necessary to familiarize students with new concepts. They also serve as stage directors, leading the class through dramatic enactments of dialogues, complete with costumes and

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John Sheldon

John Rassias at work: "You have to secure an emotional reaction. To do that I will go to any extreme."

sound effects. ATs are paid $2.65 per hour for both in-class work and two hours' preparation for a total of $7.95 per class session. After the drilling, students go to the language lab for another hour of work. While they drill with tapes of the day's lesson, other undergraduates monitor to correct pronunciation. By the end of one three-hour cycle the students are thoroughly familiar with the new material and ready to move on.

It is crucial to the success of the method that all classes move quickly. In an average drill session each of the 10 students is asked to respond 65 times. The instructor recites a phrase, then lifts his hands to signal the class to repeat

together. After this first repetition, he snaps his fingers and points to a student to recite. When the student has finished, the instructor immediately snaps again and points. If the student hesitates, the instructor points to someone else, then returns to the first student. The finger snapping gives the class a rhythm and lightning pace.

The instructor keeps the class alert by randomly selecting students, looking at one person and pointing at someone else. All mistakes are corrected. There is little emphasis on cultivating perfect pronunciation or accent. What matters is that students begin to experience the excitement of communicating in another language.

Rassias recently demonstrated how the process works by teaching a class in Modern Greek to a dozen visiting language professors. Pointing to a picture of what appeared to be a mother and father with two children, Rassias recited a sentence that some of the observers took to mean, "The mother and father are in my photograph." (This was not exactly correct, but as Rassias later explained, he is concerned first with getting students to use the language; precise translations can come later.) Rassias began at the back of the sentence, repeating a word that sounded like "photographia." The class repeated the word together, then individually in response to finger snapping and gestures. Rassias added the preceding word in the sentence, "mia"; the class repeated "mia photographia."

Gradually Rassias worked his way to the front of the sentence, until the class had repeated the unit. Throughout the exercise Rassias danced around the group, always moving, snapping his fingers, rewarding students when they answered correctly, showing his disappointment if they failed. When a Spanish professor from St. Louis repeated the Greek sentence correctly, Rassias planted a loud, wet kiss on her forehead. Others earned pats on the knees or crushing bear hugs. Incorrect answers brought on gestures of agony, as Rassias hurled imaginary hand grenades at the culprit or assaulted him with bow and arrow. When a participant struggled to complete a sentence, Rassias strained along with him, pleading silently with his hands, sometimes on his knees, as if begging for the proper answer. The histrionics kept the class laughing and alert; but more importantly, Rassias communicated the feeling that he cared whether the professors mastered the simple Greek. As a result, some of the participants found themselves absorbed and trying hard. By the end of the hour, they had learned to recite a dialogue of nine sentences, to count to 29, to give their own names, and to ask the names of others.

The Rassias technique has strong appeal, since professors and student teachers can adapt it to their personal styles. The ATs show particular enthusiasm, darting around their classes, urging on fellow students, and following the Rassias dictum that a teacher should leave his classroom exhausted. "It's a very tiring process," said Micheline Lyons, a lecturer and native French speaker who has taught intensive French in Paris. "But it is worth it. You get results. Quite a few of the students come to us with a history of failure in language. Here they have a sense of achieving something. They can see the progress they're making."

The teachers follow standard textbook dialogues but have the freedom to manipulate the material or to use whatever seems appropriate. Occasionally professors explain difficult points of grammar in English, but the ATs speak only in the target language. The Dartmouth faculty have developed a number of special drills and techniques—charades or mock television game shows, for example—that break up the tedium of the basic dialogues.

In one of the most effective exercises, the micrologue, the instructor spends a minute describing some aspect of the native country's culture. Students write down what he says. The instructor then repeats the description two more times and asks questions about it. Finally, a student is asked to restate the micrologue. This is easy, since he has heard it several times. "For the first time they're speaking the language in a way that's really theirs," Rassias explained.

Before each term, the language department holds a workshop to train ATs and new members of the faculty in the method. During the grueling three-day affair, they are taught techniques such as finger snapping and general choreography, in addition to rudimentary drama methods. ATs are encouraged to overcome their fears of standing in front of a class of students only a year or two younger than themselves. The workshop also serves as a means to select the best ATs; since about five students apply for every position, competition is keen.

ATs are selected because of their energy and skill with the language. Language majors are not given preference. Even native speakers have been passed over because they lacked the necessary vitality. Students rarely win a place after their first workshop. Some try without success three or four times. Becoming an AT is worth the effort, students say, because it is enjoyable and carries a certain prestige.

The student instructors serve as very positive role models. Incoming freshmen, who often fared badly in high school language classes, see that people with a year or two of training can run a class. They find the young instructors less intimidating than professors, and feel little fear about making mistakes. The apprentice teachers are sometimes uncertain about whether to act as supervisor or classmate. Tom O'Neil, a junior history major and AT, has also taught friends and members of his fraternity. "The first week it's a little difficult," he said. "But you establish a rapport. Everyone begins to feel they are working together and trying to help each other."

The ATs serve as a liaison, bringing students' complaints to professors and consulting with them about problems of particular students. The professors, in turn, observe the ATs weekly to offer advice. The experience of facing a class of peers has lasting impact on many of the ATs. One math major wrote Rassias that he had applied the rapid-fire language instruction techniques to math classes he was teaching in a Connecticut high school. At the end of the first year, he was elected teacher of the year. One former AT, now a doctor, wrote: "The experience as an AT has carried on, as you predicted. A sense of body humor carried over into my profession: the process of the medical interview..., the process of listening, and...picking up the emotional level of the patient. Essentially, a total 'being there' for the other person. These skills are built on your foundation."

The laboratory is considered the weak link in the program. Even so, it is an improvement over traditional operations because student monitors sit in to correct mistakes. Beginning next year, Rassias hopes to strengthen the laboratory by replacing the earphones with a video system containing recordings of simulated classes. Each class-on-film will feature students sitting in chairs being drilled by an instructor. One of the chairs will be empty. When the professor points at the empty chair, the camera zooms in on the professor's face. Looking in the filmed professor's eyes, the student in the laboratory must respond. Rassias believes that simulating

class participation is much more powerful than simply repeating words heard through earphones.

Students are graded on the basis of midterms and finals. There are the usual written exams as well as orals where students are tested individually by professors who have not taught them. In the first several years of the program, the standardized tests of the College Entrance Examination Board were also given. In 1967, when the intensive model was introduced, students immediately registered scores higher than those of the year before. French 1 reading scores went from 453 to 464, while listening went from 504 to 550. Reading scores for French 2 students went from 581 in 1966 to 598 in 1967, and listening scores climbed from 553 to 610. Significantly, both the lowest and highest scores were raised under the new method. Students who came into the course with no background in languages or poor high school preparation—including many minority students—have particularly benefited from the intensive approach. After one year, Dartmouth students taking a modified version of the Foreign Service Institute tests tend to score as well as students at many colleges with four years of classes.

Impressed by the program's results, the Exxon Education Foundation has been providing seed money for colleges to adopt the Dartmouth method, and about 10 schools are beginning to use it. The College of William and Mary and Immaculata College in Pennsylvania have already begun their programs. Two French classes are now being taught with the method at Lenoir-Rhyne College in North Carolina. The students there report that teachers have begun acting strangely, wildly throwing things around the classroom, and that attitudes about languages have changed. "In three days of class," said freshman Paul Dengler, "I've already learned more than I did in my high school French courses."

For Dartmouth, the language program has also come to play an important role in the school's liberal arts curriculum. All the introductory courses put heavy stress on cultural content and the interest that it stimulates in students extends into other courses. A classics professor, for example, says language students are more receptive to his subject. History students are reported more likely to read books in their original languages, while science students now sometimes pick up foreign technical journals. In addition the program offers students the chance to study abroad, thus expanding the College's offerings beyond the small-town New England campus. "I remember when we had a real sense of isolation," noted Gregory Prince, associate dean of faculty, who attended Dartmouth as an undergraduate. "But this has been a way to break down the walls."

After taking a language for one quarter, about 40 percent of the students elect to fulfill the language requirement by spending a quarter overseas. Students look forward to the trip, and drill instructors say that students expecting to go abroad are noticeably more enthusiastic about their work than those who will be remaining at Dartmouth. In the foreign country, students continue their intensive language program with Dartmouth staff and student instructors and take courses in the literature and culture of the country. Most importantly, the groups of approximately 20 are sent to provincial cities where each undergraduate lives with a family and is forced to converse in the native language. Contact with other Americans is minimal, and Rassias tries to keep friends apart.

The highlight of a trip to France is the "village drop." After the students have been in the country for nine weeks, they are randomly assigned a village, and given three days to travel there and produce a report on its history, economy, and social structure. The catch is that the students cannot take any money with them. They must hitchhike to the town, and once there, depend on the generosity of the townspeople. Students use their ingenuity; often they approach the mayor or a priest and plead for assistance. Some tell the truth: A wild French professor has sent them on an outrageous assignment. The villagers always respond with hospitality, delighted to show the Americans around. They have thrown parties for the students and given them gifts. The students return from the trips with a warmth for the French people that few tourists or traveling students share.

Critics charge that the Rassias method and the study abroad emphasize the vernacular of the streets, rather than the subtleties of literary language. Proponents of the Dartmouth method plead guilty to the charges, but point to the high numbers of students who advance to the higher level literature courses.

Rassias simply dismisses such criticism. For him, the goals of the intensive language program and the literature courses are much the same: teaching students to communicate on deeper levels, showing them that there are indeed other people in the world who speak different languages and think in different patterns. To emphasize the seriousness of his purpose, Rassias refuses to display the sort of sunny travel posters that often decorate language classrooms. Instead, he posts pictures of starving children. It is these people, he insists, who should help to provide the motivation for learning a language—not photographs of the Eiffel Tower. ■

Learning experience:
Beginning language courses in French, German, Italian, Modern Greek, Portuguese, Rumanian, Russian, and Spanish. Enrollment: master teacher sections, 20 to 22; apprentice teacher sections, 10 to 11.

Other descriptions:
John A. Rassias, *A Philosophy of Language Learning*. Hanover, N.H., 1967. "The Dartmouth College Experiment: New Dimensions in Language Learning." Peace Corps Faculty Paper No. 6, February 1970. "Why We Must Change," *ADFL Bulletin*, March 1972.
"A Call for Madness," *Congressional Record* 120, No. 44, March 29, 1974.
"Dynamiting Language," *Time* Magazine, August 16, 1976.
Richard Bacon, "The Thunder and Lightning Professor," *Yankee* Magazine, September 1977.
Effective Language Teaching, a film on the method available without charge through Association-Sterling Films, Department OB, 866 Third Avenue, New York, N.Y. 10022. Accompanied by a descriptive manual.

Similar programs:
Claremont Men's College, Clark University, College of William and Mary, CUNY (Baruch), Earlham College, Emory and Henry College, Florida State University (Tallahassee), Immaculata College, Lenoir-Rhyne College, Northern Illinois University, St. Martin's College, St. Olaf College, University of Denver, University of Detroit, University of Southern Mississippi, University of Montana.
(Deadlines for submission of applications for grant support from Exxon Education Foundation: February 1 or July 1.)

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BUILDING ENROLLMENTS: IT PAYS TO ADVERTISE

by William H. Trombley

Washington State University seems an unlikely place for the flowering of foreign languages. A sturdy land-grant institution in the hilly, agricultural southeast corner of Washington called "The Palouse," Washington State is known for studies in agriculture, engineering, business administration, and veterinary medicine. Yet for six or seven years foreign language enrollments have been rising steadily at WSU, at a time when they have been declining at many other institutions.

Since the fall of 1970 enrollment in language courses has jumped from about 1,200 to about 1,800, while overall university enrollment has increased only about 10 percent. There are many reasons for this success but the most important seems to have been the appointment, in February 1971, of department chairman Jean-Charles Seigneuret, a 40-year-old Frenchman with enormous energy, considerable administrative ability, and a flair for salesmanship.

Before Seigneuret's appointment, "we had the traditional approach to academia," says Gertrud S. Mazur, associate professor of German and coordinator of the German program. "The professor went into the classroom and met with the students who were there. But Seigneuret saw that that wasn't enough anymore, that you have to do some PR."

While staging a promotional blitz, Seigneuret has not drastically altered the courses offered by the consolidated department of foreign languages and literatures. Majors are available in French, German, Spanish, and Russian. Minors can be taken in the same languages, as well as in Chinese, Italian, Japanese, Latin, and Swedish. During 1977-78 courses also are being taught in Greek, Hindi, and Swahili, while in other years offerings have included Danish, Sanskrit, Arabic, and Serbo-Croatian. Master's degrees can be earned in French, German, Russian, and Spanish, and a small PhD program in literary studies is sponsored with the English department.

Nor have startling innovations taken place in teaching methods. As Renate Schulz, a University of Arkansas professor who evaluated the Washington State program for the National Endowment for the Humanities, wrote, "Course offerings and methodologies are relatively traditional. But WSU is one of those institutions where a highly committed and cooperative faculty and dynamic leadership by the chairman have effected many 'small' changes which have positively affected enrollments."

Most of the 24 faculty members carry teaching loads of 10 to 12 hours or more each semester, along with other university assignments. According to Eloy Gonzales, a young assistant professor of Spanish who joined the department this year, most of his colleagues do not share the despondency felt by many foreign language teachers whose students not only cannot handle foreign tongues but have only the frailest command of English. "Here people are enthusiastic," Gonzales says. "There is a feeling that it can be done. If the faculty believes that, then the students will believe it, too."

Housed in a cozy building that is one of the oldest on campus, the department tries not to deal with students impersonally. "Students are pleased to find some faculty who actually want to know them," says Arthur Stabler, professor of French and coordinator of French studies. "They have a chance to be in friendly contact with people who have something in the upper story to offer them." Seigneuret calls this "caring at the office door," one of the many public relations touches he has encouraged.

The Frenchman, who has taught at WSU since 1966, became department chairman not long after he headed a committee which studied the department's slumping enrollment and blamed it partly on cautious, conservative ways. "I felt kind of guilty" when the previous chairman resigned not long after the committee reported its findings, he says, "but you have to do public relations. You have to get out and sell your department." Shortly after becoming chairman, Seigneuret began to bombard the campus with announcements, brochures, and posters about foreign languages, on the ground that "this was a good teaching department, but our basic problem was lack of exposure on the campus. There were unfriendly advisors all over the place who thought all we did was translate documents."

Seigneuret and his associate, David P. Benseler, a professor of German, wrote departmental news releases and then badgered the University's public information office into distributing them to the widest possible audience. Finding spicy news items in a department of foreign languages and literatures was not easy, but Seigneuret and Benseler, who has since become chairman of the German Department at Ohio State University, were equal to the task. "We didn't make up stories but we did look hard for them," Seigneuret recalls with a small laugh. "Most humanists are reluctant to advertise themselves. They say, 'It's not done.' Well, how will people know about you if you stay in your little office? After only a few months we were much better known on campus, not necessarily because we were better—although I think we were—but because we were promoting ourselves."

To publicize departmental offerings, the chairman tries to contact all incoming freshmen—a practice frowned on by the University registrar—and follows up with personal letters to

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Designated a national historical monument, Thompson Hall houses the Department of Foreign Languages and Literatures.

those who request specific information about courses, careers in foreign languages, and degree programs. He has also urged faculty members to become active in state and national professional organizations. Seigneuret himself travels all over the state of Washington to meetings of high school foreign language teachers, and he has arranged to publish the journal of the Washington Association of Foreign Language Teachers—"to let them know there is a foreign languages department at Wazzu" (the student nickname for Washington State). Just this kind of activity is particularly important for Washington State, a geographically remote campus, 75 miles south of Spokane and 8 miles west of the Idaho state line. WSU is not a major stop on the academic main line.

Seigneuret keeps careful records of enrollments in all of the department's courses in a thick folder he calls "my bible." "This way I can see problems easily," he explains, "and I don't have to depend on the rather meaningless figures that come from the central computing office." When the numbers begin to drop he immediately speaks to the professor involved or to a coordinator (there are coordinators for French, German, and Spanish) to see if the problem can be identified and solved. He queries students who have dropped language courses, asking them why, and he pays close attention to course evaluations, which are undertaken voluntarily in about two thirds of the department's courses.

Most of the 24 faculty members have tenure and cannot be replaced, no matter how low their enrollments or how poor their course evaluations. But Seigneuret spends a lot of time with professors who are having enrollment problems and sometimes shifts class assignments. More importantly, he controls the department's merit salary increases, subject to administrative approval, and so is able to reward teachers he thinks have done well.

The chairman's public relations, and his hard eye for enrollment statistics, do not sit well with some members of the department. One has called him the "Mad Man Muntz of academic life." Some think he coddles students, at the expense of quality instruction, an opinion that Seigneuret strongly disputes. He has been reappointed chairman twice, but each time he was opposed, in preferential balloting, by about one third of the departmental faculty.

A majority of his colleagues probably would agree with this assessment by Mazur: "My attitude toward academia is still very much a traditional one, but I am enough of a realist to know I can't just sit in my office and wait for the students to come. We aren't too delighted to do the public relations stuff, to put it bluntly, but it is effective. Before Seigneuret took over, the administration was threatening to take away money and positions from foreign languages, so it was a matter of necessity."

Some curriculum changes have been made. In French, German, and Spanish, "skills" courses in composition and conversation have been added, replacing some literature classes as major requirements. "Students are much more interested in Spanish for practical purposes than they are in Spanish literature, and we have made changes to accommodate that interest," says Billy Weaver, coordinator of the Spanish program. At the same time, 20 upper-division students have enrolled in Eloy Gonzales's *Don Quixote* course, which is not "practical" at all, evidently because they find the young Cuban an exciting teacher.

The introductory work in some languages, formerly done in two semesters, has been extended to three because, Seigneuret says, "if a student gets too much thrown at him in the first years, he won't be back next year. It's better to learn less, but learn it well." The Spanish faculty experimented with individualized instruction at the introductory level but has largely abandoned it. According to coordinator Weaver, students found the frequent one-on-one oral quizzes too taxing and "wanted a more traditional type of course where they could lose themselves among all the other students."

Some literature courses are offered in English translation but success has been spotty. A German course on Herman Hesse has attracted 40 or more students in recent semesters, but similar courses on French and Spanish writers have not proved as popular. More solid success has been achieved with intensive summer workshops, now offered in French, German, Spanish, and Japanese. Attending classes eight hours a day for eight weeks and speaking the language all the time, students are able to accomplish from two to four semesters' work. The summer workshops make it easier for them to take double majors—combining their foreign language with another subject—a practice that the department encourages. Only about 60 students major exclusively in foreign languages and literatures, but many others take double majors in fields that include communications, fine arts, and hotel administration.

Learning experience:
Undergraduate courses in French, German, Spanish, Russian, Chinese, Italian, Japanese, Latin, Swedish, Greek, Hindi, and Swahili; master's programs in French, German, Russian, and Spanish; PhD program in literary studies, jointly sponsored with English department.

Other descriptions:
David P. Benseler and Gertrud S. Mazur, "A New Approach to Language Learning for Graduate Students," *The Modern Language Journal* LVII, Sept./Oct. 1973, pp. 259-262.

Contact:
Jean-Charles Seigneuret, Chairman, Department of Foreign Languages, Washington State University, Pullman, Washington 99163, (509) 335-3564.

Joseph Labat ("Le Roi") and his assistants take a break during a French workshop.

Not all of the enrollment increase in foreign languages can be credited to Seigneuret and his colleagues. Some externals also came into play. Consistent support from the university administration has helped, although that support has not taken the form the department would like most—additional faculty positions. "Even though this is a land-grant institution, we have been given authority to develop a strong liberal arts program," says Allan H. Smith, academic vice president. "I suppose our interest in foreign languages is sort of an inheritance out of that past."

The decline of foreign language instruction in Washington's high schools has generated some additional lower-division enrollment at WSU among students who need language credits. The College of Sciences and Arts has a minimal foreign language graduation requirement: one year of study in college or two in high school. Increased attention to the farm labor problem and to other concerns of Spanish-speaking people probably has upped Spanish enrollments somewhat, although only 158 of the 16,665 students enrolled for the fall 1977 semester have Spanish surnames.

Joseph Labat, who has taught at Washington State since 1973, offers a more philosophical explanation. "Pullman, you must realize, is very isolated, not only geographically but culturally as well. The reality of the world outside here is based on economics and pragmatism, but that is not the reality here. There is no reality in this town besides the University. It keeps the students and the people of the town closer to the metaphysical meanings of life. There is more acceptance of literature and the arts. In urban universities many humanities professors doubt their use or their validity because, increasingly, these universities have become places where you go to get a job. There is some of that here but not too much. There is more attraction to traditional values, more acceptance of the idea that there is a value in knowledge of foreign languages and cultures."

But Labat also gives much of the credit for the enrollment increase to Seigneuret: "The chairman is, at the same time, a humanities professor and a businessman. He can deal with the economic realities of academic life while at the same time reinforcing those who believe in the importance of the humanities."

A few years ago the University's office of institutional studies predicted a drop in foreign language enrollments, but Seigneuret had learned enough of the technology to produce his own, more optimistic predictions. "You have to know how the game is played," he explains. "If they throw statistics at you, you have to know enough statistics to answer." His figures proved correct.

"I always believe you do not sit back and fight a defensive battle," he insists. "You attack! We never allow ourselves to be treated like second-class citizens. We will not allow ourselves to behave like some foreign language people around the country—when you kick them in the rear they say, 'Thank you very much, please kick me again.' We don't accept that."

Why do some foreign language teachers display this "kick me again" attitude? Because "most humanists are retiring, introspective personalities," Seigneuret replies without hesitating. "They have the feeling that good things will happen to them because they are such wonderful people, because they contribute so much to civilization. That's true, to some extent, but when there is trouble and humanists are attacked by the 'practical' men who run universities, they don't know how to respond. They go into their offices, close the door, and hope it will go away.

"They are threatened," he continues. "I can see why—it's easy to feel threatened. There is an important legislator in this state, a big farmer who reportedly said, 'As I sit on my tractor I can't see the importance of foreign languages.' It's easy to be threatened by people like that. But you have to stand up and say you are important. What we're doing is just as important as anything the scientists or the farmers are doing. If you really feel that, then you can deal with them on equal terms."

Seigneuret will need his talent for publicity and his combative nature to solve the most serious problem now facing his department—the lack of new faculty positions. Although enrollment has increased by about 50 percent since 1970, the number of department faculty members it had then has held constant at 24. So teaching burdens grow heavier and there is little time for research.

It is difficult to be a scholar, many faculty members complain, when you are teaching 12 hours or more each week. "We manage, but it's beginning to show, I think," Mazur worries. "All of

The Language of Survival:

Six years ago, Henry Cordes of California's two-year College of San Mateo resolved to enliven a foreign language department that, it had become apparent, was lagging behind the community's needs. The evidence was undeniable: Enrollment in French, German, and Spanish had dropped. Sound enough reasons were offered: For one thing, the department's eight full-time day instructors and the eight part-time evening teachers had been offering traditional courses for the benefit of transfer students, and the receiving state universities had just dispensed with their language requirements. Other forces could be blamed, too, and were. But the fact remained: Fewer students were interested in what San Mateo was offering.

Was any school in the area having luck with a foreign language program? Cordes took note that two were: The local Berlitz and Sullivan schools were packing them in—not for Racine and Molière but for their students' basic touring needs abroad. Accordingly, Rose Marie Beuttler, a member of Cordes's faculty, created Survival French, the first of several minicourses designed for San Mateo's prospective vacationers—those who

Jean-Charles Seigneuret demonstrates his belief that individual attention to students is important in building enrollments.

us have reached a degree of intellectual weariness. There isn't enough time to refresh." And because most members of the department have tenure, she explains that "there is little young blood coming in."

Vice President Smith is sympathetic, but offers little hope of rescue. "Those fellows over there work like dogs," he acknowledges. "They teach a killing schedule. They have this kind of devotion. I applaud them for it. I only wish I had the resources to reward them." But WSU has received only small budget increases in recent years, and according to Smith the limited number of new faculty positions must go to agriculture, engineering, and business administration—"practical" fields where enrollment demands are heaviest.

Seigneuret is aware of the implications of such thinking. "I have reached a plateau," he says. "There are only so many 'consumers' and I think I have my share. To get more will require some new thinking. But if I get more I'm cutting my own throat. How long can I keep squeezing my faculty when there are no resources, there is no relief? I am of two minds now. If I go down [in enrollment] that's not going to help, but if I go up I can't handle the students."

Then the chairman smiles. Somewhere in his imaginative mind a plot was hatching to extract blood from a budgetary stone. "But, of course, within myself I know there is no choice," he concludes. "I must go up." ■

Find a Need and Fill It

previously had had to choose high-cost commercial schools.

The course was funded by the College's Community Services department, which held tuition low, and an enthusiastic crowd of 45 showed up the first night. The class met two evenings a week for five weeks. Students were given a 250-word vocabulary in phrases that would help them get around in France, along with pronounciation practice. Je m'appelle... je voudrais...ou est...s'il vous plait—necessary phrases for travelers with no prior exposure to French.

The feedback was gratifying. One woman, for example, whose rented car broke down on a country road, reported instant results from one phrase Beuttler taught her. She didn't know "battery" or "generator"—the course hadn't promised that—but she did know "au secours," and was thankful for it when someone rushed to her aid.

Later, Survival French did some traveling too. In response to requests, it moved off campus into the recreation halls of apartment complexes. And the Survival program grew; minicourses in Spanish, German, and Japanese were set up.

Cordes got even more out of the venture than he'd expected. Having found a new and different audience in the community for the minicourses, he tried adding a beginning-level conversation program to San Mateo's day schedule for two units of nontransfer credit, and that was equally successful. It didn't, as he'd feared it might, deplete the traditional courses taught during the day. Instead, it brought in housewives, retired people—all those whose interest in further language study had been whetted by the minicourses.

This enthusiastic response, said Cordes, pointed the way to San Mateo's future. He got requests for other beginning courses for specific vocational purposes. So, in Spanish, San Mateo has offered courses designed for social workers, police officers, and nurses—and, in French, for airline personnel. The Survival minicourses started at all.

Instead of blaming the administration, the lack of a university requirement, or other forces for low enrollments, Cordes said, the department's members had learned to plan together to meet the community's real and pluralistic needs. They'd relaxed their overriding concern for maintaining traditional academic standards and aimed courses with a view to individualizing them so as to retain as many learners as possible.

The minicourses aren't being taught in 1977-78, at least not at San Mateo. Following a budgetary restriction on the Community Services department a couple of years ago that tripled the cost to students, a regional consortium decided that the courses, which didn't offer college credit, should be taught at the high schools.

But the experiment, according to Cordes, has not failed. The courses, he points out, were co-opted not only by the high schools in the San Mateo area, but at community colleges elsewhere in California—including Foothill College in Los Altos Hills, which is now teaching them under the Survival titles. "We've demonstrated there's a real demand for foreign languages," Cordes has written. "Community colleges that identify and meet it can extricate themselves from their presumed predicaments."

For more information: Henry M. Cordes, Department of Foreign Languages, College of San Mateo, San Mateo, CA 94402, (415) 574-6161.

LANGUAGE LEARNING IN A SUPPORTIVE ENVIRONMENT

by Charles J. Sugnet

Earlham College, in Richmond, Indiana, is a very small school with a strong commitment to providing high-quality undergraduate instruction. Most of its approximately 1,300 students live on the campus, many faculty live nearby, and the Quaker spirit of the place encourages a strong sense of community. If a particular course or program is not doing well, everyone soon becomes concerned about it. This was the case in 1970 with the three-course introductory foreign language sequences. Students were taking them largely because of graduation requirements, and many who had completed a sequence had not in fact attained proficiency in the language they studied. The language faculty was ready to try something new.

Howard Lamson, then a new instructor in Spanish, decided to make some major changes in language instruction. Earlham sets aside a fixed percentage of its budget for curricular and faculty development, so the College gave him not only encouragement but practical help. The course Lamson designed, Intensive Spanish, was first run in 1972 and was so successful that its format and principles have been extended to German and French as well. Student attitudes toward language classes have now changed, and many more students actually master a language, rather than simply fulfilling the requirement. A new double-credit course—Super Spanish—has been introduced more recently and is also a great success.

Like other good modern language programs, Earlham's intensive courses are based on conversation and oral mastery. Students actually speak the language from the first day of class, and speaking knowledge is one of the program's chief aims, though some written exercises are introduced fairly early in the term to insure literacy. True to their designation as "intensive," the language classes meet five days a week for three hours a day with the time divided as follows: In the first hour, students meet in groups of eight or ten with a student instructor for spontaneous conversation in the foreign language and perhaps some drills based on the previous day's lesson. In the second hour, all students (16 to 24) meet together with the faculty instructor for a lesson introducing new material, or perhaps for dictation or a quiz, and for more spontaneous discussion. In the third hour, students meet in very small groups (four or five), with a different student instructor than they had the first hour, for practice in the language lab, conversation exercises, games, or plays. After an initial term of this intensive class work, the group spends the next term abroad, studying language, culture, and history in a foreign country where they can apply their new expertise.

The intensive format, Lamson says, simply incorporates into the course the work students were previously expected to do on their own time. Super Spanish, the double-credit course, involves a nearly equal amount of formal class time, but students are expected to do considerable after-hours work. There is not normally an official term abroad for the Super Spanish students, but a surprising number of them manage to travel to Latin America on their own.

The new course owes a great deal to the Peace Corps' style of intensive language training and to a course originally introduced at Dartmouth (see "All the Class a Stage," page 30), which Lamson visited in the early 1970s. But Lamson's course involves much less rote drilling and is less indebted to behaviorist models of learning. He frequently mentions Carl Rogers, Abraham Maslow, Charles Curran, Caleb Gattegno (*The Silent Way*), and Paolo Freire (*La educación como práctica de la libertad*). From these eclectic sources he has fashioned a course devoted to the notion that language is a social tool, best learned in situations where we are actually trying to communicate, and that language is (as Chomsky and other lin-

CHARLES J. SUGNET is a professor of English literature at the University of Minnesota in Minneapolis.

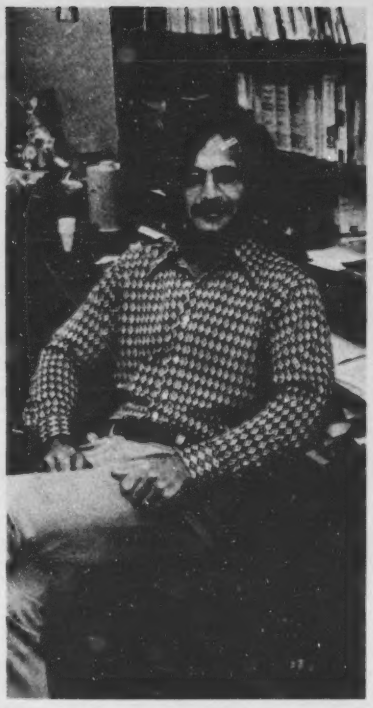
guists have demonstrated) open-ended and creative.

One other clearly established fact about language acquisition is that it's easier for children than adults, and while there is no scientific evidence that regression can recapture this facility for adults, the spirit of childish play can hardly hurt a language course. It is common at Earlham to see a group of language students lying on the floor around a map of Mexico or Colombia inventing fictional autobiographies out of their limited beginner's vocabulary ("I was born in Bogotá. My mother was a schoolteacher....") or doodling pictures of their ideal beloved and constructing accompanying descriptions ("My love has long green hair. He looks like a tall house."). The course includes explanations of grammatical principles, and there is tightly structured drill, but the emphasis is on setting up situations in which students can use their ability in open-ended communication, situations that encourage them to play with the language. Frequently, these exercises involve three or four students teaching each other off in a corner of the room without an instructor.

Anyone who has ever taken or taught a conversational language course knows that the first difficulty is simply overcoming shyness and embarrassment, so that students will not be afraid to express themselves in a language in which they are bound to make mistakes. Lamson usually begins the course with a very unthreatening exercise from Gattegno's *The Silent Way*: He enters the room with a box of colored sticks and rods, places one of them in front of him, and pronounces the Spanish words that describe it. Instead of insisting that all silences be filled, he gives the students time to follow his example and begin playing with the colored sticks and repeating the appropriate Spanish phrases.

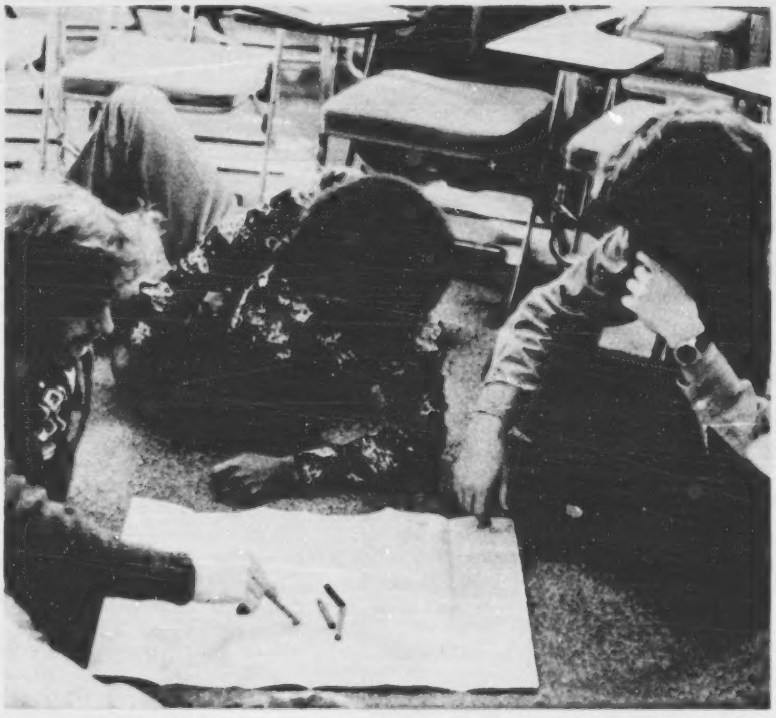
Lamson's personal teaching style is a paradoxical combination of energy and humor with quiet; it's clear he cares about what he's doing, but he doesn't overwhelm the students. Erlinda Gonzalez-Berry, who also teaches intensive Spanish, has a very different manner, more brisk and forceful, but still not intimidating, partly because she seems to be having fun and is open to the possibilities of humor in class conversations. In the class sessions I observed, students participated with an amazing eagerness and confidence, even those who were behind the class in language ability.

In one group of the previous year's students I met with, there was a shy girl



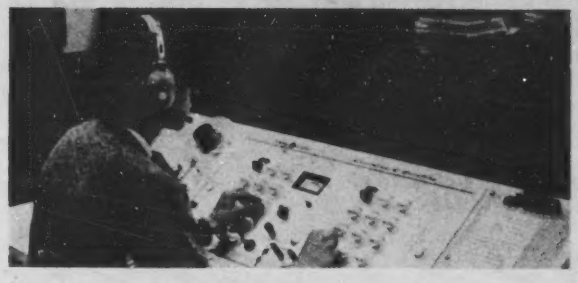
Charles J. Sugnet

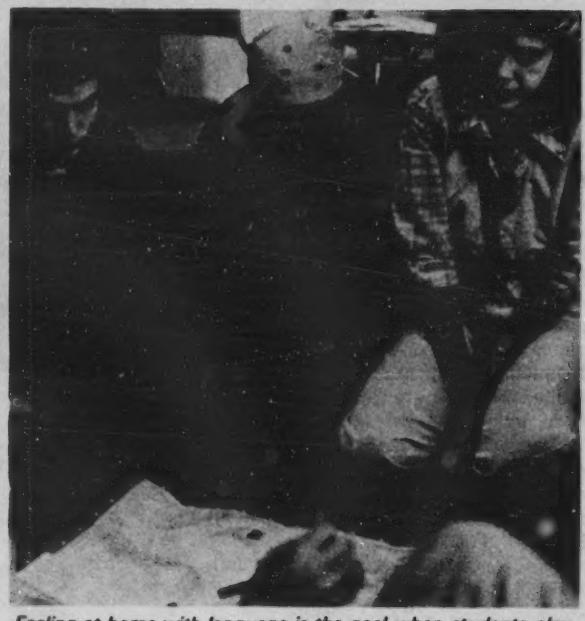
Howard Lamson and Erlinda Gonzalez-Berry relax between classes.



Students use Gattegno sticks and map to learn Spanish phrases.

Billie Brown





Feeling at home with language is the goal when students play with puppets, listen in the laboratory, and gather on the floor for study games.

who spoke only during the last few moments and then gave powerful testimony about how hard the course was for her at first and how its method finally won her over (even though it obviously had not overcome her natural reticence). One of the course's main assets in this regard is its willingness to be silly, to use even the most trivial drawings or games as occasions for the use of language. The students aren't afraid to be clownish, to expose themselves by making mistakes; and when there is laughter, it stems from communal enjoyment, not mockery.

Also significant is the fact that students have confidence in the instructors and don't worry that they will be penalized for early mistakes. Though Earlham students are quite serious about their work, they display a remarkable absence of grading paranoia. Instead, they think of their language skill as an objective, almost public matter. Everyone in the class can see just how well everyone else is doing, so performance virtually grades itself.

The group awareness of individual students' levels of competence is an important feature of the course. It is assumed from the start that the students will learn from each other as well as from the instructor, that the class as a group has a responsibility to any member who is working in good faith, and that the quality of the overall experience is heavily dependent on full participation by all members. If a particular student is having difficulty, other students will help him or her and in the process will learn by teaching. If that student is not making a full effort, he or she will be made to feel in various ways the gravitational pull of the group. This peer influence is partly a manifestation of Earlham's strong tradition of service and community orientation that is derived from its philosophy as a Quaker college, but can be made to work in any small group that believes in the worthiness of its endeavor.

The spirit of students teaching each other is extended and formalized by the use of paid student instructors, without whom the course could not be run in its present form. Most of these instructors have already taken the intensive language course, though jobs are open to others who can demonstrate proficiency. Those who qualify financially for work/study are paid at the frugal work/study hourly rate; others are given a lump sum (on the order of $50 a term) or paid with academic credits. Though the money is important and makes the work a real job, it is clear that other motives must be important to the student instructors, who work very hard for their modest pay. There are always more applications than positions, and the student instructors enjoy what they're doing, believe they're learning from the experience, and show a strong attachment to the course and the other staff members.

All student instructors take a methodology course, which meets for a two-day workshop before the term begins and for two hours a week during the term. They study theories and methods of language learning and exchange ideas about practical aspects of teaching. The methodology classes use books like Curran's *Counseling-Learning in Second Languages* and engage in discussions of general educational issues, not just those that bear specifically on language acquisition. Native speakers or students with particularly good accents are assigned to the third hour lab sessions, since these concentrate heavily on pronunciation. Those who seem particularly skilled with a larger group are assigned to the first hour class sessions. Scheduling is designed to maintain both continuity and variety—no group will have the same student instructor for five lab sessions a week, nor will it have a different one each day.

I expected the student instructors to have problems assuming authority. But in the sessions I visited all the instructors were remarkably competent in the language (which is itself a tribute to the intensive course in which most of them learned it) and were able to be friendly while at the same time exert leadership. One tricky pedagogical problem that arises with great frequency in modern language courses is the question of what to do when the class begins to lapse into English. Time after time, I saw the student instructors bring the class back into the target language by patient persis-

tence. They did not scold or deliver sermons; neither did they join the students in speaking English.

Part of the students' calm in their role as teacher is doubtless due to the clear and effective design of the course; the instructors go into each class session knowing exactly what they are going to teach and equipped with a variety of practical ways to do it. The relatively homogeneous nature of Earlham's student population helps too: Most students choose Earlham because they want to work seriously in small classes, so there is less testing of the young instructors' authority than there might be at a large state school. Regardless of such favorable circumstances, their work is difficult, and they do it well. Even a brief look at the schedule will show how large a part they play in the course and how much of its success is due to their efforts.

And there is little question about the new language program's success. Student evaluations (used fairly seriously at Earlham in tenure and promotion decisions) have been very laudatory. Other language instructors, hesitant or even hostile at first, have been convinced by Lamson's method. Many students have, after only one term of intensive study, passed competence tests exempting them from the three-course language requirement. All these are signs, verified by the intuitive knowledge of Earlham's small community, that the language problem that existed a few years ago has largely been solved by intensive language instruction.

Only two reservations are expressed with any frequency. One is that while intensive immersion (submersion might be even more descriptive of the initial experience) in a language is very beneficial, it is also trying. The course is fun, but it *is* demanding. A few students confided that they dreamed about their Spanish class and found themselves practicing even in their sleep. The instructors noted that there was a certain weariness about two thirds of the way through the term and that it was a good idea to plan a holiday or cultural festivity of some kind to ease the students over this period. But a certain degree of fatigue seems worthwhile when measured against the benefits of intensive instruction; one could argue that many traditional courses cause nightmares and weariness without conveying much knowledge.

The other complaint frequently voiced is clearly a consequence of the course's success: namely, that there isn't an appropriate next step after intensive or Super Spanish. Students going on to the third term of the old language sequence were disappointed by the method of instruction and level of content. The effectiveness of the intensive courses will almost surely necessitate some adjustments in other areas of the language curriculum, including the addition of something like Intensive II courses. (Incidentally, other departments seem pleased with the intensive method as well; no one, faculty or student, has complained that other courses are being neglected by students in intensive language.)

There is no inherent reason why a similar course could not succeed at another institution, but anyone attempting to initiate such a program should note a few special features of the Earlham situation.

One is the physical plant: Earlham's classrooms (at least those used for language classes) are carpeted, well lit, nicely furnished, and of the proper proportions for small-class work. The language department offices radiate from a central reading area decorated with posters and equipped with a supply of foreign language magazines. These may seem minor details, but they are not. Most of the classrooms I teach in are so dirty and ill furnished as to make many of Lamson's exercises impossible; my students would never think, for instance, of reclining on the floor over a map—it's just too filthy. And few department offices (indeed few academic spaces of any kind) invite lounging, and the attendant sense of communal identification.

Another related factor is this intangible sense of community and common endeavor so marked at this small undergraduate school. What passes for a small class (about 25 students) at my own institution is considered large at Earlham. And Earlham backs up its commitment to high quality instruction with a teaching load of two courses per term for most regular faculty. At an institution where research and publication are not required of faculty, this is very reasonable. For the faculty member teaching an intensive language course, that course (including the daily class sessions, supervision of student instructors, and the methodology course) is his or her whole teaching load for the term. One full-time faculty member and as many as 10 student instructors are employed to teach a class of 24 undergraduates, a ratio that shows that Earlham means what it says about offering the best instruction possible.

Moreover, because of its size and budgeting methods, Earlham is able to run its program of study abroad with very little subsidy. The overseas program is budgeted separately and overhead at Earlham is low, so it's possible to put each trip together as a separate package in which student tuitions cover the salary and expenses of the accompanying faculty member. The school is not particularly rich, nor are its individual students: Earlham does a very good job of recruiting—and keeping—black students from eastern and southeastern cities, and a very high percentage of its students overall are on financial aid. But most students who take the intensive course do go abroad during the following term, and it would be hard to overestimate the positive effect this must have on the course. Many of these things are peculiar to Earlham, and a teacher attempting an intensive language course elsewhere would have to make some modifications. But all the evidence shows it would be worth the effort. ■

Learning experience:
Intensive Spanish and French for beginners and those with very limited experience. Average enrollment per class: 20. Annual total enrollment: 110.

Other descriptions:
Earl Stevick, *Memory, Meaning and Method*. Rowley, Mass.: Newbury House, 1976.
Paolo Freire, *La educación como práctica de la libertad*. Mexico: Siglo veintiuno, 1974.
Charles Curran, *Counseling-Learning in Second Languages*. Apple River, Ill.: Apple River Press, 1976.
Leon A. Jakobovits and Barbara Gordon, *The Context of Foreign Language Teaching*. Rowley, Mass.: Newburg House, 1974.
Howard Lamson, "Intensive Language and Cultural Immersion: A Cooperative Method," *Foreign Language Annals*, December 1974.

Similar programs:
A number of colleges have variations of intensive language programs. Several have adopted the Dartmouth College model.

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TAKING THE MIDDLEBURY PLEDGE

by Peter Binzen

Late in the spring a familiar ritual unfolds at American colleges and universities. Classes end, seniors graduate, and, following alumni reunions, most institutions shut down until Labor Day. Even those colleges that run summer sessions generally operate on relaxed schedules with reduced staffs. The pressure is off and the living is (relatively) easy.

In the Green Mountains of central Vermont, however, Middlebury, a small liberal arts college, follows a dramatically different summer timetable. To its picturesque campus late in June come hundreds of graduate and undergraduate students from many parts of the United States, as well as from Canada and abroad. They take over most of Middlebury's dormitories, dining halls, language laboratories, and classrooms, there to be taught by professors from universities in Rome, Paris, Madrid, Innsbruck, Mainz, Bogotá, Ottawa, and other cities both foreign and domestic.

The students—some 1,200 last summer—are drawn to Middlebury's noted language schools. They spend six to nine weeks "living the language" of their choice: German, French, Spanish, Italian, Russian, Chinese, or Japanese. With its clear air, cool nights, and spectacular mountain scenery, Middlebury seems an ideal spot for a summer vacation. But this is no holiday for students—they normally spend up to three hours a day in classes and five hours studying or working in labs. All students sign a pledge not to speak English all summer, in or out of the classroom. Although the different languages may mix for sports or other recreational activities, each school is segregated from the others in living arrangements: Students and staff are housed and fed in dormitories and dining halls assigned to each school. Beginners in Russian are kept apart from more advanced students, but other schools permit various levels to mix. "It's an emotional strain," says Beth Ackerman, 19, of New Castle, Pennsylvania, a Middlebury junior who attended last summer's Russian school. "But that's the nature of the program. If you change that you change the whole program."

Since Middlebury opened its first summer language school in 1915, an estimated 15,000 students have completed the rigorous July-August program. The majority are teachers working for graduate degrees or taking refresher courses, but in recent years Middlebury has admitted small numbers of beginning language students in response to a strong interest on the part of undergraduates. This move, while viewed as risky by some traditionalists who feared a watering down of the entire program, has helped keep summer enrollments up at a time of dwindling national interest in foreign languages.

Running the seven summer language schools costs about $1 million a year and most of the money comes from fees charged students. Tuition, room, and board runs about $1,000 for six weeks, $1,400 for nine. Last summer's enrollments ranged from 60 (the Japanese school) to 375 (the French school).

The man in charge of this intensive effort to help Americans develop foreign language skills is a 42-year-old, 6-foot-5-inch native Yorkshireman and British subject named Roger M. Peel. Peel, who has a full crop of dark hair and a rapid manner of speaking, is professor of Spanish, dean of foreign languages, and director of the language schools. He watches over all language budgets—one for each of the language schools in the summer plus five for overseas language programs during the academic year. The overseas schools, offering both undergraduate and graduate programs, are in Paris, Madrid, Mainz, Florence, and, since October 1977, Moscow, where Middlebury enrolled nine students at the Pushkin Russian Language Institute.

One of the strong attractions of Middlebury's summer schools is their cosmopolitan faculties. Each school has a director, responsible for faculty recruitment and curriculum, and a dean who handles admissions and student records. All deans are Middlebury faculty members during the regular school year; but the directors are scattered far and wide from September to June, joining at Middlebury for the summer. Last summer's French school director came from the University of Michigan, the German director from the University of Paris at Nanterre, the Spanish director from Middlebury's school in Madrid, the Italian director from San Francisco State, the Japanese director from the University of Pennsylvania, and the Chinese director from Princeton. The only indigenous director, the Russian school's Robert L. Baker, left Middlebury in September to open the school in Moscow.

This wide variety of home bases does cause communication difficulties, but they are outweighed, Peel says, by the advantage of having people who can recruit topflight language teachers on several continents. The Italian school, for example, drew its faculty last summer from three Italian universities and from universities in Virginia, Idaho, Maryland, California, Rhode Island, and Vermont. Salaries are modest but teachers and their spouses get free room and board in a splendid summer setting.

From Peel's point of view, one of the great advantages of the summer schools is their tenure rule. There is none.

PETER BINZEN is the metropolitan editor of the Philadelphia Bulletin. He is the author with Joe Daughen of The Cop Who Would Be King [Little, Brown], a profile of Philadelphia's Mayor Frank Rizzo.

Erik Borg

Left: After midterms, students perform a Japanese Bon dance, a mid-summer celebration of thanksgiving. Right: A French student works with a tutor.

Teachers are signed up one summer at a time; those hired once or twice have no guarantee of being asked back a third time. Peel sees faculty tenure as a deadweight to progress. "It's hard to change the curriculum," he said, "because you're frozen by the talents of your tenured people. With an untenured faculty, however, it is possible to make up the curriculum and then go out and find the professors who can teach the courses you have in mind." This flexibility—fitting faculty to the curriculum rather than vice versa—is relatively rare in American higher education. Without tenure to fret about, the directors can scout around for professors to give courses such as anthropology taught in Spanish and art history taught in French.

Throughout its 62-year history of summer language schools, Middlebury has held firm to the principles laid down when the first school opened for 41 students of German in June 1915. Tuition for the six-week course was $30 and room and board cost $8 a week. Most of those who enrolled were teachers; beginning students were barred. "One of the chief objects of the courses is to enable the students to understand and speak German with ease," wrote Lilian L. Stroebe, founder. "This can only be attained by constant practice; for this reason the school must demand a promise from its students to avoid the use of their own language, and to speak German only, outside as well as inside the [dormitory].... While the morning will be taken up by the different courses, the afternoon will be devoted to private study and to out-of-door exercise. For conversational practice, the teachers will accompany the students daily on their walks and excursions. In the evening, there will be social gatherings, illustrated lectures on German life and art, dramatics, readings of modern German poetry, music, etc....the meals will be taken at small tables with a German teacher in charge of each.... Thus the students will have the opportunity of hearing and speaking German from eight in the morning till ten in the evening."

Learning experience:
The Middlebury College Language Schools, including the Schools of Chinese, French, German, Italian, Japanese, Russian, and Spanish conducted during the summer on the Middlebury campus in Vermont and the Middlebury schools abroad in France, Germany, Italy, Russia, and Spain operated during the academic year. Enrollment: 1,200.

Other descriptions:
Stephen Freeman, *The Middlebury College Foreign Language Schools: The Story of a Unique Idea*. Middlebury College Press, 1975. Reprints of articles and other descriptive material is available on request.

Contact:
Roger M. Peel, Director of the Language Schools, Middlebury College, Middlebury, Vermont 05753, (802) 388-7879.

The German school was an instant success. It was followed in 1916 by the French school and in 1917 by the Spanish school. In 1932 the Italian school was added. Middlebury's Russian summer school opened in 1945, its Chinese school in 1966, and its Japanese school in 1970. From 1926 to 1970, a French professor named Stephen A. Freeman was actively involved in the language schools and for the last 24 of those years he was their director. Freeman left his mark on the summer schools and helped give Middlebury an international reputation in foreign language teaching. Like Stroebe, he believed firmly in extracting the promise from students not to speak English. In writing a history of the schools, Freeman quoted a former director of the German school who warned that strict enforcement of the pledge was essential and that any concession to "permissiveness" would "spell ultimate disaster." Freeman himself cautioned that when the program began accepting beginners it would "find it more difficult to be outstanding here."

Current director Peel believes that Middlebury has succeeded here—with no decline in standards. He attributes the national falloff in foreign language students to the dropping of language requirements by many colleges and universities. Distaste for overseas ventures of any kind, resulting from the Vietnam War, may be another factor, he thinks. He also believes language teachers and

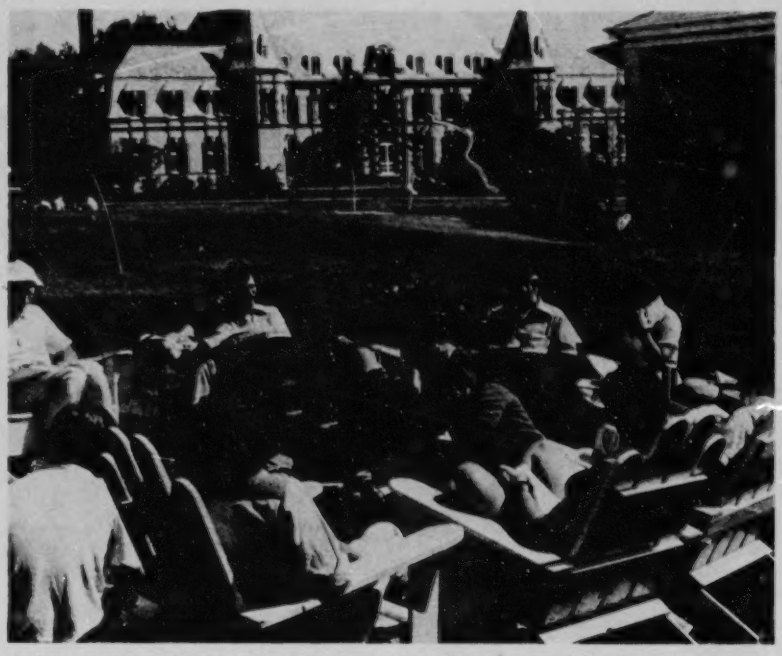
department heads must accept some of the responsibility. "For many people," he explains, "foreign language study represents some kind of punishment. It's been relegated to the basement of the curriculum, a wretched hurdle. The foreign language departments have shown little imagination in structuring themselves. French 1, French 2—it's been a standard package, predictable, a straitjacket. A great deal of the problem is our own."

Peel acknowledges that beginners can study languages elsewhere—at Berlitz, for example—at less cost. But he's convinced the Middlebury experience is worth the price; his cohorts agree. The package involves not only language instruction but a total living experience. For example, last summer the French school, in addition to its standard curricular fare, sponsored eleven French films, four plays, eight lectures, one operetta, and one concert. "The French school gives me a community I can't get in winter," says Edward C. Knox, its dean. "It's a busman's holiday. In winter teachers must be generalists. You go with specialists in summer. The students are older and well motivated, the setting is beautiful, and you have interesting colleagues. It's teaching under optimum conditions."

Robert Baker explains that the smaller language schools are, in effect, subsidized by the larger ones. The Russian school, which had 188 students last summer, turns over a small amount for general overhead. His school started taking beginning Russian students in the summer of 1973. Some "old-timers" were upset, he says, but Baker himself considers the move "very farsighted. Otherwise," he says, "the critical mass would have been too small."

In Baker's opinion, the Russian school would function better if it were totally isolated from the others. But he concedes there was an advantage in students who know more than one foreign language having access to the cultural programs of all schools. Baker says his major headache is not with the students but in "keeping peace among the faculty. Often the chemistry is wrong," he notes. "There are three generations of immigrants in the Russian faculty and there have been political arguments."

Regarding the language pledge, Baker says, "It's true we hear some English on campus, but we try to restrict it. For a while it was almost impossible to enforce the pledge. Kids would say, 'I paid my money, go bleep yourself.' But in the last couple of years the students have been far more serious." Graduate students and undergraduates are awarded credit by Middlebury for the summer program that is usually accepted by the students' home institutions. Undergraduates in French, German, Italian, and Spanish get six credits for each level; those in the nine-week Chinese, Japanese, and Russian programs earn ten credits. Graduate students get two credits for the French, German, Italian, and Spanish programs.



Erik Borg

A French class takes in the sun in front of a chateau on Middlebury's campus.

When Middlebury, which is one of the nation's most prestigious small colleges, undergoes evaluation its summer program is reviewed as well; and the College is conducting an extensive survey of all language school alumni, analyzing how they have applied their language skills. Administrators point out that the U.S. ambassador to the Soviet Union, Malcolm Toon, is a Middlebury summer language school alumnus and that Walter Wriston, head of First National City Bank in New York, studied French there one summer.

Individual schools evaluate their own programs at the end of each summer. Gerd Schneider of Syracuse University was coordinator of last summer's seven-week undergraduate German language program. It had 7 full-time faculty and 79 students, including 32 beginners. In his report, Schneider noted that while questions concerning quality of the food drew mixed replies, students overwhelmingly endorsed the teaching program. Most thought the language pledge was a good idea. All but two wrote that they would recommend the school. They did suggest certain changes, including more emphasis on correct pronunciation of German and more testing. But the overall student response was positive. "It is a fantastic program," wrote one. "I have never seen such a tremendous faculty—patient, insightful, interested—together in one place."

Peel says the summer language students go from agony to ecstasy. "It's a terribly artificial atmosphere," he says, "but the crucial element cuts through. We have a sufficient number of native speakers. They make it authentic."

The summer language schools have given Middlebury a national, even an international reputation. Certainly, the schools are stimulating—and cosmopolitan. Where else but in the Middlebury dining halls in July and August might one ask for seasoning for the soup by saying to a tablemate: "La sal, por favor."

Or: "Il sale, per favore."
Or: "Le sel, s'il te plait."
Or: "Salz, bitte."
Or: "Oshi o totte kudasaimasen ka."
Or: "chiing dih yan geei woo."
Or: Передай, пожалуйста, соль.

Studying Languages Without Learning One

Two of the problems that often confront students facing the prospect of foreign language study are selection and fear. The idea of having to stumble through the simplest of sentences in order to learn a second language understandably touches inhibitions and drains self-confidence. And if this is overcome, the question of choice still stands before many students who have never had experience with any language other than their own. Several years ago, the department of foreign languages at Murray State University in Murray, Kentucky, developed a course that would provide a foreign language experience without requiring students to sign up for French, German, Spanish, or Russian, and one that in the bargain might inspire them to continue with formal language training.

Cultural Introduction to Languages is an interdisciplinary course led by Howard Keller, associate professor of Russian and linguistics. It meets 3 days a week for 50 minutes, and its three credits are applicable to the nine-credit humanities requirement and to a language major or minor. The course is not required of language majors, however, and these students constitute only 15 percent of an average class. This is fine with Keller: "I'd rather fill the room with impressionable freshmen and sophomores," he explains. "Our main goal is to proselytize. Language majors have already got religion."

The course consists of nine components; all seven Murray State language professors, including chairman John Ferguson, participate where their specialties are called for and guest lecturers from other departments also contribute. The first section deals with the effects of geography on language, the expansion of languages through colonization and migration, and the development of dialects in regions and large cities; black English is one example studied. Part two covers the origins of language and the evolution of dialects into separate languages, as well as the evolution of English and its place in the Indo-European family.

During the third section, students examine the deep culture of language. A faculty member from the counseling and testing center talks about interpersonal communication and leads students in role-playing exercises. A philosophy professor discusses how language affects the logic underlying an individual's philosophy. The relationship between language and culture is examined by a member of the anthropology department, who explains societal differences in nonverbal means of communication. Highlighting the study of Old English and Middle English, an English professor reads *Beowulf*.

The structure of language as the element of order in communication is covered in part four, along with the similarities of Germanic, Romance, and Slavic grammars, and the differences between Chinese and Japanese grammars and writing systems. The entire department participates in the fifth section, a study of sample dialogues in French, German, Russian, and Spanish: A tape is played of a brief conversation, the class choruses the foreign words, and then two students act out the roles. Cultural features that surface in the exchange—for example, a French boy and girl discussing their separate *écoles*—are enlarged upon by the professor. Though no actual language is taught in this or any phase of the course, the department believes that mimicking words and acting out foreign situations acquaints students with the sounds, gestures, alphabets, and other communication devices of unfamiliar cultures.

Language and related sciences are examined in part six. Keller presents scientific contributions such as medical terminology from all four languages. A psychology professor lectures on language acquisition. Language pathology is dealt with by a member of the speech and hearing clinic who describes the relationship between the brain's function and language defects. Words and sexual equality is another popular topic covered in this phase: A female professor in home economics or social work discusses the unfairness of English to women, and Keller demonstrates that our tongue is a lesser offender, giving examples in other languages from Spanish to Icelandic.

Part seven examines literature. Students read such books as *Night Flight*, *Siddhartha*, and *Doña Perfecta* in English; the appropriate professor then goes over one or two passages in the original language, showing differences in shades of meaning. Music, opera, art, architecture, and films of major cultures are studied in part eight, with faculty from corresponding departments often participating. The final section, titled Language and Beyond, covers computer language; the possibilities of artificial intelligence; language as a conditioner in advertising, philosophy, and rhetoric; and symbols, signs, and codes.

While one might expect that guest lecturers would be hard to recruit, Keller points out that "on any campus there are closet language nuts in nonlanguage departments—the music teacher in love with French tone poems, the art department member who's a fan of German Expressionism. Often they're secretly dying to be asked to give a lecture. All universities have these people—MSU is not a blessed island in the midst of a desert. This course puts to use the best talents a university has."

Students say they enjoy the course, and recommend it to friends; professors who have guest-lectured often suggest it to their classes. And Keller has heartening reports from former students who now teach high school: Several have said the course has enriched their teaching. The proof, however, is in the pudding, and Keller can point proudly to evidence that the course accomplishes its purpose: Though it began in 1974 with a slim enrollment of 12, the number has now reached 44. But more important, by fall 1976, enrollment in foreign language courses at MSU had blossomed by one third.

For more information: Howard Keller or John Ferguson, Department of Foreign Languages, Murray State University, Murray, KY 42071, (502) 762-2501.

An Institutional Commitment to Study Abroad

At a time when many universities are dropping their language requirements altogether, Kalamazoo College in Kalamazoo, Michigan, not only trumpets the value of a second language but makes every effort to bring a study-abroad experience within reach of all its students. One of the few colleges that can boast of an institutional commitment to foreign study, Kalamazoo does, in fact, build it into the curriculum: Students choose from four-year plans that include one, two, or three quarters overseas. And course scheduling on campus is carefully designed so as not to exclude students in any major from participation.

Though the program is neither required (except for language majors) nor automatically available, most Kalamazoo students have participated since it began in 1961, thanks to the largesse of a former chairman of the board of trustees. When Richard L. Light traveled with his family to the French language institute at Grenoble in 1958 he was impressed enough by the experience to establish a $2-million trust fund at Kalamazoo to subsidize foreign study. Thus the cost of going abroad, including incidental overseas expenses, generally does not exceed the regular $1,500 quarterly tuition for resident students. Participants may spend two quarters in France, Germany, Spain, or Africa; one quarter in France, Germany, or Spain; or three quarters in Africa.

All participants are required to spend the time preceding departure—usually a summer quarter—on campus; students who have just returned must be on hand too. Assistant director of the Foreign Study Program William Pruitt explains that "a lot of the orientation is informal, the result of students about to depart mingling with those who know the ropes. They find out about the tough parts, the boredom, the hard work. Because they know what they're getting into, less than 1 percent go home early."

There are orthodox orientation activities as well. A two-hour session each week during the quarter includes lectures on such topics as cross-cultural perception, culture shock, and the responsibilities of American students abroad. Participants must take a language course that quarter regardless of how many they have had previously. Africa-bound students hear additional weekly lectures featuring experts like University of Michigan scholar Lemuel J[illegible]son from Sierra Leone.

As each program begins, Pruitt and program director Joseph Fugate fly to Geneva, the initial arrival point for all students, where they spend a week meeting flights (Kalamazoo's board of trustees requires that no more than 30 students travel on the same plane). To shake jet lag and make time for a final orientation session, each group stays in the city for two days. Pruitt and Fugate then put them on trains or planes for their final destinations, where they are met by local people retained by the College to arrange housing. (Most participants live with families, though a few are quartered in dormitories.) During the program Fugate and Pruitt make periodic visits to all overseas institutions where Kalamazoo students are enrolled and Pruitt is on hand initially at African universities to help with registration.

Some African universities offer only nine-month programs, preferring foreign students to be in residence for the full academic year. As in Europe, fluency level determines placement: Students going to Senegal must have taken at least four French courses, and Kalamazoo requires them to pass an interview in French in order to move immediately into courses given in the language. Some institutions provide compulsory courses in the major local language—those entering the University of Dakar, for instance, take 100 hours of Wolof.

Back home on campus there are various debriefing activities. Language skills are formally tested and results are compared with those on the same test taken prior to the trip; Pruitt reports impressive jumps in fluency. A 20-page questionnaire—for which Fugate ensures 100 percent return by withholding program credit until it is handed in—requires students to evaluate their orientation, travel arrangements, and housing, and to compare the quality of courses taken overseas with those on campus. The questionnaires are intended to encourage students to reflect on their experiences as well as to provide information. Fugate and Pruitt also meet with returnees. An afternoon is set aside for each department to meet with its majors and that evening, at a dinner for all students who have been abroad, faculty fill them in on what has taken place on campus while they've been away.

In the past four years the proportion of Kalamazoo students participating in foreign study has hovered around 75 to 80 percent, down somewhat from earlier figures. "Preprofessional students are afraid the program will hurt their chances for law or medical school," Pruitt says. "But we point out that the experience gives them a leg up on competitors because it makes them more interesting. Our students are actually very successful at getting into graduate school. In fact, several have been accepted into medical school after only three years including the overseas quarters."

Others demur because of finances: They can't earn while abroad and many are not only on scholarship but on work/study as well. "But they don't always let us know that money is what's stopping them," Pruitt laments. "When they do, we can usually find funds within the endowment." Comments flow in from all disciplines on how much more sophisticated and knowledgeable students are after having been abroad. Pruitt notes that this keeps faculty on their toes: Because students know firsthand what has been going on abroad for the past six months in art, economics, and politics, professors must hustle to keep up. Perhaps most gratifying, students come back stimulated, refreshed, and eager to tackle their majors once again.

For more information: Joseph Fugate or William Pruitt, Foreign Study Program, Kalamazoo College, Kalamazoo, MI 49007, (616) 383-8470 or 383-8471.

The Participatory Classroom

When Claire Gaudiani, assistant professor of French at Purdue University, wants to summarize the philosophy behind her teaching methods, she simply conjugates the verb *apprendre*. It means both to teach and to learn—and in Gaudiani's intermediate French classes the two processes are no longer distinguishable. In the participatory classroom she has devised, students undertake a sizable part of their own education.

The keystone of Gaudiani's approach is the Personal Assessment Statement (PAS), an evaluation form that students fill out on the first day of the semester, rather than the traditional last. Explaining why they have chosen the course and what they expect its content to be, and describing their French background, they spell out for both Gaudiani and themselves the goals they expect to achieve. Providing frank information on their strengths and weaknesses, their outside interests and skills, the amount of time they can invest in the course, and the teaching methods they respond to best, they make a first step toward delineating the stumbling blocks that stand between them and these goals.

Gaudiani reads the PAS sheets carefully, and she rereads them about every two weeks throughout the term. On the first day they enable her to identify and dispatch elsewhere students for whom the course is patently inappropriate. But the sheets also give her an invaluable perspective from which to approach the rest of the class.

To reach those timid students who generally fade to the back of the room, she strikes a public bargain with the class. They must speak up if they are to master the language—but she promises never to call on a student if his or her hand is not raised. Each student must promise in return, however, to volunteer an answer at least once per class session. Incredulous underachievers soon realize that she means what she says, and they are drawn into the current of class discussion.

Eager, verbal students, on the other hand, find that Gaudiani neither quiets them nor allows them to monopolize the class. Instead she uses their enthusiasm to supplement her own, casting them as leaders in pre-exam review groups, occasionally allowing them to team-teach a new grammatical concept. Every few weeks the class breaks into small groups for practice and review; aggressive students, particularly relied upon to keep up the pace during these "workshop sessions," discover an outlet for their energies.

Similarly, students who regard every minute spent in French class as a minute away from the darkroom, the piano, or the lab are drawn into the group in spite of themselves.

Dave Umberger

Gaudiani arranges for each of them to offer a "seminar" during class time on his or her outside interest. Lecturing in simple French and moderating the ensuing discussion, these students begin to realize that a foreign language is not a conflict with, but simply an extension of, any given interest.

Finally, those students who are accustomed to taking the path of least resistance to a passing grade learn that Gaudiani has a bargain for them too. She goes out of her way to enliven the classroom, shunning the podium and moving in and out among students' chairs as she delivers anecdotes and model sentences too witty, ridiculous, or, often, risqué to be ignored. She varies the structure of the class with seminars, workshop sessions, and an occasional guest speaker who introduces students to the nuances of French wine or slang.

The path to higher education, Gaudiani emphasizes throughout the semester, is a two-way street. She will help the students, but they must help each other and they must help her. "Study couples," consisting of a strong student and a weaker one working together, are encouraged. Group pre-exam review sessions are also encouraged and, to Gaudiani's great delight, are often organized without any assistance from her. She insists that students provide a constant flow of feedback, requesting teacher evaluations at the middle and end of the semester plus self- and class evaluations after every test, and initiating periodic frank discussions about how the class is going.

But preeminent in Gaudiani's philosophy is the tenet that students must help themselves. To this end, she never grades tests; she simply circles errors. They must correct their mistakes, grade their tests, and then write an evaluation of the test and of their performance on it. Only then, in a private conference with Gaudiani, is a mutually satisfactory grade arrived at.

Gaudiani denies that she has introduced any revolutionary or even innovative ideas into the classroom: She has simply combined a spectrum of creative techniques with a little common sense and a great desire to trust, understand, and stimulate her students. To an overwhelming extent, they have justified her enthusiasm. Instructors adopting her approach have reported equal success, and Gaudiani sees no reason why the techniques cannot be applied to other levels of French, other languages, and other fields of study. "It's a little more demanding for the teacher," she admits, "but the results are certainly compensation enough."

For more information: Claire Gaudiani, Department of Foreign Languages and Literatures, Purdue University, West Lafayette, IN 47907, (317) 749-2685 or 255-7269.

Languages and the International Business Connection

For students drawn by the allure of jobs in foreign affairs and international business, the University of Cincinnati offers several career-related foreign language programs that emphasize the development of languages as practical skills. Chairman of Germanic Languages and Literatures Helga Slessarev is unimpressed with the way students planning international careers are usually prepared. "Business colleges do not require training in languages or area studies. Some colleges add a business course or two to their language programs for this field, but it's just a shallow token," she says.

Students in Cincinnati's International Business Option, a program begun in 1973, pick from two alternatives: In a four-year plan they can augment their language and culture studies by using all electives for courses in the College of Business Administration to receive a general or international business certificate in addition to the baccalaureate; or they may take a five-year co-op program alternating work and study quarters during the last three years that earns them, in addition to the language BA and Business Certificate, a Certificate of Professional Development.

The International Business Option is rigorous: Indeed, Slessarev points out, it's almost like a double major. Students must decide early if they want to participate, because they must begin as sophomores to lay out every quarter of their remaining undergraduate years in order to structure the intricate network of business and language courses. For the regular Business Option, 63 credits of business courses are required; for the international certificate, World Marketing, International Economics, and International Management are added.

Students in the College of Business Administration who participate supplement their studies with language courses, receiving a certificate in a foreign language. These programs—available in French, German, and Spanish—prepare students for careers in international banking, marketing, transportation and service organizations, insurance, export-import, the foreign service, travel, and hotel management.

All language students in the co-op program are required to take Professional Development I, a one-credit course taught by co-op program coordinator Helga Daley that covers career planning, resumé writing and interviewing, and basic self-analysis methods. Daley has students cut out help-wanted ads in the *Wall Street Journal* and formulate answers; the course is designed to help language students recognize the practicality of their skills in the job market.

The German work/study program, developed in 1967, is a particular boon to students taking the International Business Option in German. "We immerse the student totally in German society," Slessarev explains, "unlike other colleges that have simply established branches abroad. Those programs are only separate as far as geography—students usually speak English and live in dorms just as they would on their home campus. With our help, students are thrown into German life, live with a family, and function so comfortably as employees that their colleagues don't experience them as a foreign element."

The four-month work/study program is open to undergraduate and graduate students of any accredited American college or university who have at least 15 credits of college German with a B average or better; they must register with the University of Cincinnati and will earn 18 quarter credits. The cost is approximately $1,700 and participants are responsible for their own transportation to and from Germany; they also pay for meals and local transportation during the eight-week work phase.

Selections are made on the basis of grades, letters of recommendation, results of a language achievement test, and, where possible, interviews. Those chosen provide biographical material that is sent to the program liaison in Hamburg. It is used to match participants with host families and employers. That jobs are found for all students Slessarev attributes to her many friends in Hamburg; "I would hesitate to give the impression that one could as easily begin such a program in Germany today," she points out. "The economic climate is not what it used to be and openings go to Germans."

Faculty in the German department take turns directing the program, which opens in late summer with the six-week learning phase. In 1975, for example, classes began in August at the University of Hamburg; results of the achievement test were used to separate students into intermediate and advanced language groups, which met every day for 90 minutes. (Most students find this amount of study satisfactory, but a few think it is too little to bring them to the level of fluency they need to function painlessly in the country.)

The culture course, conducted daily in German, included a brief survey of German history since 1900 and dealt with political, economic, social, and cultural factors of the postwar years. Field trips and guest lectures were frequent: A government official led a tour of the Hamburg city hall and discussed municipal problems; efforts to meet the postwar housing shortage were described by the builder of a socialized apartment project; insurance representatives lectured on the pension system; and the director of a journalism school discussed the news media's role in West Germany and arranged a party to introduce his own students to the work/study participants.

Most participants consider the work phase the most enjoyable and relevant part of the program. The 1975 group worked in bookstores, department stores, haberdasheries, kindergartens, offices, and export firms; one music student was employed by a well-known organ builder. On the average, each received about $380 a month. According to critiques, all jobs were acceptable, though because of economic conditions some did not match career plans. The program concluded with a week in Berlin.

The program in Germany is popular with nonlanguage majors as well; Slessarev points out that "so much of a music student's library is

in German that the work/study experience gives them a fine exposure to the culture the composers represent. And the premed department encourages its students to participate, believing that the program expands their perspective. We also had a biology student who was given a very responsible job in the German equivalent of the Environmental Protection Agency."

Participants represent not only many disciplines but many parts of the United States. Announcements are sent to every German department in the country, and some colleges send students every year. "Many return to their campuses to earn a BA and then do graduate work here as a result of the program," Slessarev notes. "Though other language departments across the country often have a tough time attracting graduate students, we get more than enough. They appreciate our approach—many foreign language departments use English in the classroom, but we insist on German. In addition, both undergraduate and graduate students get a lot of individual attention when they apply here. Our prospective students are constantly in touch with us."

Cincinnati also offers an area studies major to language students as an alternative to the traditional literature major. Available in Asian, French, German, Latin American, and Spanish studies, this program deals with the culture and contemporary institutions of the country. In the German area studies major, for instance, students combine three year-long courses in composition and conversation with history, political science, economics, art history, or music. Selections are limited to one or two outside areas so students won't be tempted to put together a too-broad cafeteria-style menu; the department prefers to see them attain greater competency in a more limited sphere.

Slessarev reports that the program is having an effect in high schools: "The American Association of Teachers of German [AATG] has been pushing area studies," she says, "and now high school teachers and our colleagues in the Greater Cincinnati Consortium of Colleges and Universities are seeing the payoff in student interest. These kids get a clearer picture of the practical uses of language studies. They realize they can add components in college to prepare them for interesting careers in business or the foreign service." Faculty involved in the various programs receive many invitations to speak at local career day programs and the number of high school students taking languages has increased. Helga Daley encourages them to come in and talk about the options in the foreign language program.

It is also Daley's responsibility to find jobs for many of the students. She says of the Business Option students: "When I tell prospective employers I have a language major, they assume the student is only qualified to translate and write letters. But when they see all the business courses in the curriculum, they realize how valuable an employee he or she can be. Traditional foreign language majors aren't very marketable; the Business Option makes them far more attractive to employers. The ones I deal with think it's the only way to go." In fact, when a German businessman marketing a new type of wall decoration needed someone to run his U.S. office, a Cincinnati student with a BA in German and a Business Certificate filled the bill.

While the dean of the College of Business Administration is wholeheartedly in favor of the business/language programs, not all of the faculty share his enthusiasm. Although there is a strong group within the business faculty that has begun to identify with the international community, Slessarev has encountered some difficulty convincing others of the importance of language and area studies for students entering international business. "It would be fantastic for language departments if more business students became interested in what we have to offer," she muses. "Nationally, language departments make more of an effort to tie in with business than vice versa. But the business community should see that it isn't good enough to train students in international business, send them abroad, and enroll them in a Berlitz course. Often these people must be brought back at great expense because they just can't get comfortable in the foreign atmosphere."

> *"Nationally, language departments make more of an effort to tie in with business than vice versa. But the business community should see that it isn't good enough to train students in international business, send them abroad, and enroll them in a Berlitz course.*

Among international business leaders opinion is about evenly divided between language enthusiasts and traditional thinkers, but the former are emphatic in their support of a well-rounded background. Slessarev relates that "the president of DuBois Chemical has said he would not be able to function in international dealings without his background in language and culture."

"If colleagues at other institutions can learn something from us," Slessarev writes in *Die Unterrichtspraxis*, the AATG journal, "it might be the interdependence between existing programs, and the emphasis on resources available on one's own campus. Other language departments may not be able to add more than an area studies option because resources for a business orientation or co-op program may not be available. But awareness of the practical value of language skills can be created just as easily on a campus oriented toward the arts. As long as language faculty are flexible, there will be a growing demand for language for professional use by more students in many fields."

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PHYSICS

PHYSICS FOR A CHANGING CLIENTELE

by Arnold A. Strassenburg

College teachers of physics as a group devote more time to elementary-level courses than to all courses at more advanced levels combined. Most of the students in elementary courses are captives—physics is for them a requirement, not an elective. What is more, their reasons for learning about physics are extremely varied. Some must learn the basic laws describing static structures because they will someday design bridges. Others need to develop the ability to make intelligent judgments on proposals to strengthen safety regulations at nuclear power plants. It follows that motivating students and making physics interesting by diversifying course content—with regard to the topics treated and the level of mathematics used—are problems for physics educators. In recent years these matters have received much attention, and a variety of approaches have been tried in an effort to match offerings to changing student attitudes and needs.

The Laboratory. Almost without exception, physics teachers agree that students in introductory courses should spend a number of hours each week in the laboratory. However, there is little agreement concerning the primary objectives of laboratory work, and even among those teachers who subscribe to similar objectives the diversity of implementation strategies is vast. Some teachers believe students learn best when they discover regularities in nature by working with real systems. According to this view—which is supported to some extent by modern learning theory—generalizations and abstract reasoning will follow more readily once real phenomena, involving concrete objects and specific events, have been experienced. Adherents to this view insist that observation must precede theory, and practical considerations might also dictate that students explore simple situations with simple equipment so that basic laws reveal themselves convincingly.

Other physics teachers assert that the laboratory is a place to teach skills such as measurement, data analysis, the graphic presentation of information, inductive reasoning, and the communication of results both orally and in writing. Among teachers who seek this latter goal, some would concentrate on precision equipment and classical experiments, with accuracy of data and thorough understanding of theory at a premium. Others would involve students in ongoing research, putting them in the role of assistants to experimenters working at the frontier of some subfield of physics. Still other teachers choose to emphasize the exploratory nature of experimental work and encourage students to engage in original projects without prescribing procedures or instrumentation to be used.

These and other approaches have been tried in endless variations with mixed success. Unfortunately, precise statements about success are seldom possible because thorough evaluation of these techniques is usually lacking. College physics teachers are, after all, seldom trained in educational evaluation and may, in fact, not think of their efforts as genuine experiments. This inability to be certain when a change is an improvement—or, indeed, to assess whether any useful objectives have been achieved by introducing new instructional methods—may have serious consequences. Laboratory instruction is expensive in terms of both equipment and staff. At smaller institutions, tight equipment budgets tend to discourage innovation in laboratory teaching and have forced the elimination of laboratory work in some physics courses. Large universities are usually endowed with adequate amounts of equipment, but their practice of relying heavily on graduate teaching assistants in high-enrollment courses is not conducive to the use of new approaches that have not been thoroughly tested. Without experimentation and evaluation, laboratory teaching in

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physics may stagnate before methods that satisfy faculty and students are perfected—or may even disappear from elementary courses at some institutions.

Physics for Poets. In 1964 many physics teachers attended a conference on physics for nonphysics majors. Prior to that time most physics courses populated by students without developed interests in the field were simply pale versions of the introductory courses taught to future scientists and engineers. The topics discussed and instructional methods employed were largely independent of the audience; only the mathematical sophistication was adjusted to suit the backgrounds and career goals of those enrolled. Since 1964 the proliferation of elementary college physics courses has been phenomenal. The need for more diversity to meet the demands of an increasingly large and varied student body was loudly proclaimed by several leaders of the physics education community, and these exhortations, without doubt, set the stage for major change.

In the late 1960s, however, a sharp decline in the attractiveness of physics as a major provided a much more powerful stimulus to seek a new clientele among students committed to other disciplines. Offerings such as Physics for Poets, The Physics of Music, and The Physics of the Environment popped up at virtually every college and university in the U.S. The quality of these new courses remains largely unevaluated; without doubt it spans a wide spectrum. Even more troublesome is the fact that there are no national criteria by which quality can be measured. The profession doesn't know what its service role should be—or perhaps it is more accurate to say that each institution determines its own role and these vary enormously. Students, of course, have voted with their feet, but not all physics teachers would agree that students qualify as the architects of their own science educations. In any case many new physics courses now exist and some thrive. Their long-range effect is yet to be determined.

Major Curricula. Along with the development of new courses for nonphysics majors, attention was devoted during curriculum conferences to the diversification of what was at one time a uniform major curriculum. Some innovators urged more concern for students who might elect physics as a major without making a career commitment. Conferees recommended that institutions develop two major tracks: one for students planning to apply to graduate programs in physics, the other for those studying physics as preparation for careers in medicine, law, business, teaching, etc. Design of the first curriculum—called R for research—was thought to require only minor adjustments to the program already in place at most institutions offering a physics major in the early 1960s. The second—labeled S for synthesis—was viewed as a major new project, which the physics community undertook with vigor—and substantial support from the National Science Foundation. Sixteen years later there is still no S curriculum that fits the originally conceived mold, though much effort has produced a variety of innovative courses and curricula, and physics graduates are certainly different today, as judged by what they do immediately after receiving their baccalaureate degrees. Once again, assessment of the effect of these innovations on teaching and on students will require an effort that has thus far only barely begun.

New Instructional Materials and Methods. As new courses and curricula were designed and tested, new instructional materials and teaching styles were also tried. Only a few innovations that have had major impact will be mentioned here. First, physics teachers have experimented extensively with media: Films, in particular, have found their way into the classroom. The American Association of Physics Teachers manages an active film repository through which the creative efforts of its members—particularly products that have no commercial market value—are shared. Single-concept 8mm loop films are the most popular; 35mm slides are exchanged in a similar way, and appear to be gaining in popularity with both faculty and students. Computer-based instructional methods are also playing a significant role: Computers are used as tutors, as aids in problem solving, as a way to produce simulated data when the real experiment is too expensive or too time consuming to perform, and as a way to generate graphic presentations of physical phenomena. With the cost of hardware decreasing, the use of computers increases daily and is likely to continue to do so in the coming years.

Another innovation that has had a major impact on physics teaching is the Keller Plan. Experiments on every scale from 6 to 600 students, encompassing physics courses from the elementary to the graduate level, have been tried. Evidence suggests that individualized instruction and mastery learning have strong appeal and will be offered as options, if not as the primary methods of instruction, at many institutions of all sizes. Finally, the increasing availability of modularized instructional materials is influencing the content and method of physics teaching. Modules introduce the flexibility that makes it possible to tailor courses to specific students or groups of students, to modify courses each year in order to respond to the changing interests of faculty and students, and to maintain the relevance of course content.

Change has certainly come to college physics teaching. What remains to be done is to identify the roles physics can best play in preparing students for a changing world, to determine which innovations help to achieve specific objectives, and to filter out those that do not so that the overall quality of physics teaching can be maintained at a high level. □

TOWARD A MORE REASONABLE PHYSICS: THE INQUIRY APPROACH

by Barry Mitzman

Only about one third of today's college students are able to reason in an abstract, logical way. That, at least, is the implication of recent research based on the work of Swiss psychologist Jean Piaget. Tests modeled after Piaget's famous clinical experiments with children confirm that only about 30 percent of college students consistently can perform what Piaget calls "formal operations"—tasks requiring formal reasoning about concepts such as logical inference or conservation of mass. For example, large percentages of college students are unable to follow short, simple syllogisms on the order of, "All Albertans are Canadian; John is Albertan; therefore John is Canadian." Perhaps more surprising, one third of all school children—the same proportion as for college students and older adults—can perform Piaget's formal reasoning by age 14. Crudely put, most people never learn to think, and those who haven't learned by the time they're 14 never do.

What does it all mean? "We face the implication," says Arnold Arons, professor of physics at the University of Washington in Seattle, "that our educational system is not contributing to intellectual development." Arons is a courtly, white-haired scholar with the fierce conviction that though schools teach reading, writing, and arithmetic, they completely neglect the most basic skill of all: the ability to think independently, systematically, and logically; to wonder, observe, and infer; to analyze, criticize, and explain—in short, to reason. Arons thinks this is because most schoolteachers lack the capacity themselves, and that he blames on the colleges and universities that train them.

Now Arons and a small group of UW faculty and graduate students are teaching elementary physics in a way that guides students through the developmental process Piaget has described as necessary for nurturing abstract thought. In courses for nonscience students, for students preparing to teach elementary or secondary school, and for working teachers, Arons and his group help the science-shy gain a grounding in the physics of everyday life before launching into the otherwise dizzying abstractions of atoms and molecules, energy and velocity. In this way, Arons believes, virtually all students can gain at least some understanding of both elementary physics and the principles of scientific reasoning, of what we know and how we know it. An ambitious claim. But Arons says that by the end of the one-year physical science course he has developed, the great majority of students show significant gains in reasoning ability and intellectual confidence.

One problem with traditional science teaching, Arons believes, is that students are deluged with facts—the end results of scientific inquiry—with no understanding of how those facts were established. "Any student can tell you, with an ingenuous smile, that the earth is spherical and that it and the other planets revolve around the sun," Arons notes. "But if you ask how he knows these assertions are true, his smile turns to dismay and embarrassment." How, Arons asks, are such students any better educated than those in medieval days who would assert the opposite, that the sun and planets revolve around the earth, for the same reason—because authorities say so?

Students lack real understanding, Arons says, because "lecturing at large groups of students leaves virtually nothing permanent or significant in their minds." Instead, teachers should lecture less, and listen and question more. Students learn by having "direct personal experience with phenomena, evidence, inference, concept formation, and quantitative reasoning."

The best example of the kind of teaching Arons advocates takes place in the introductory physical science course he created eight years ago, Physics 101, a three-quarter course offered for five credits each quarter. (Students must complete at least two quarters to receive any credit.) The course has two sections. One has an average enrollment of 35 students, half elementary education majors and half other nonscience majors fulfilling the University's general education requirements. The other section, with about 50 students, was begun two years ago for disadvantaged, mostly minority students in a special preprofessional health sciences program.

The course format is a modified version of the personalized system of instruction (PSI), in which students work through study units on their own and pass a competency test before leaving a unit. Students work on units at home and in a class that meets five hours a week in a large laboratory. The instructors lecture very little, bringing students together for group discussion only occasionally in order to synthesize concepts on which they have already been working.

Arons calls his approach "inquiry-oriented teaching," which departs from the PSI format in encouraging students to work in pairs so they can help one another and explain their observations and inferences in their own terms. Students are allowed to work at their own pace, but within limits; and in another departure from PSI, they may advance to a new study unit without complete mastery of the old. This works, Arons says, because they will be "continually spiraling back and reusing earlier concepts, models, and lines of reasoning in new and increasingly rich contexts."

The special section for underprepared students is more tightly structured than

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the regular section and involves more required homework, more frequent assignments with rigid deadlines, more written reporting back and forth between students and teachers, and more individual guidance. Lillian McDermott, an associate professor of physics who works closely with Arons and teaches the special section, tries "to make everything a concrete experience." But these students respond to the course in "essentially the same way as the others," Arons says, and differences between the sections gradually fade as students gain skills and confidence.

During class, at least one professor and two or three graduate students circulate around the laboratory, answering questions—or, rather, answering them with other, leading questions. Arons and his group use a gentle version of the Socratic method, constantly asking students, "How do we know? Why do we believe? What is the evidence?" Students are encouraged to accept nothing on faith, but to discover for themselves why scientists believe what they do. Arons admits that not all scientific knowledge can be proven to elementary physics students, but he maintains that they have never known how to distinguish between assertions accepted on faith and those for which they have followed at least some of the evidence. "Before submerging them in end results," he says, "it is essential to lead them to an understanding of the basis for some of our most fundamental ideas."

Arnold Arons: "We face the implication that our educational system is not contributing to intellectual development."

The ideas of Physics 101 embrace astronomy, atomic molecular theory, energy and electricity, Newton's laws of motion, waves, and light—typical subject matter but presented with what Arons calls a "story line," one chosen to cut across the subject matter of current elementary school science curricula, which many of these students may one day teach (using an inquiry approach, Arons hopes). The course begins by challenging students to answer two major questions: Why do we believe in the discreteness of matter, in atoms and molecules? and What leads us to assert that the earth revolves around the sun?

Students explore the first question by gaining a concrete understanding of some properties of matter: weight, mass, area, volume, and density. They learn about weight by balancing objects, about volume by filling things up, and about density by immersing things in water. Following one of Arons's mottoes, "Idea first and name afterwards," students count squares covering surfaces

All photos by Barry Mitzman

Students are encouraged to accept nothing on faith, but to discover for themselves why scientists believe what they do.

and cubes in geometrical solids before talking about "area" and "volume." Without this concrete experience, Arons says, many never would really understand the technical terms they use.

A traditional introduction to astronomy might consist of a textbook discussion of the solar system, including a historical digression on Ptolemy's heliocentric model and the revolution wrought by Copernicus, but Physics 101 students begin outside class, observing where the sun and moon rise and set, noting changes in their paths through the sky, and measuring distances from the horizon in arm's-length fists. Because many have never looked at the sky in an objective way, some are astounded to find that the moon often can be seen in daytime, that the stars move, and that the sun does not pass directly overhead at the stroke of noon.

Students learn about weight by balancing objects, about volume by filling things up, and about density by immersing things in water.

Through two quarters students continue tracking the sun and moon, gradually accumulating enough data to try to explain what they see. They are encouraged to test their inferences, to make predictions and observe further, and to revise their model of the solar system on the basis of what they see. In the end, some are frustrated to find that naked-eye astronomy alone cannot prove Copernicus right or Ptolemy wrong. But by then students understand enough about how scientists work to appreciate the subtleties involved in deciding between competing explanations of phenomena—one of the most basic concerns of science.

Physics 101 is not only about physical science but also about something more general if not more basic: thinking. One stated purpose of the course is to develop students' powers of abstract reasoning, which Arons has defined as "recognizing and controlling variables, doing syllogistic reasoning, discriminating between observations and inferences, recognizing inadequacy of information or evidence, translating words into symbols and symbols into words, forming models by inductive reasoning and drawing deductive inferences from the models, doing hypothetico-deductive reasoning and arithmetical reasoning—particularly that involving division or proportion."

No more than 25 percent of Physics 101 students are able to perform such "formal operations" when the course begins, Arons has found. Another 25 percent are what Piaget calls "concrete operational"—their thinking is bound by their immediate experience. The rest are somewhere in between, sliding in and out of abstract and concrete modes of thought. At the end of the year, tests show that 85 percent of the students can perform at least some of the tasks involved in abstract reasoning.

Students' comments show marked changes in attitudes toward science and learning: "I always thought I was too stupid to understand anything about science," one student wrote in a course evaluation. "Now I have learned how to inquire, how to use knowledge as building blocks to pull everything together." One current student explains why he enjoys coming to class: "Here they care

whether you really understand."

Arons's work at the nexus of physics and educational psychology might seem strange for a man with a Harvard PhD in physical chemistry and a distinguished research record in physical oceanography. But he grew increasingly concerned about science education during his 22 years at Amherst College, where he taught elementary physics, and he recalls that his teaching philosophy began to evolve even earlier. "Somewhere along the line as a graduate student I realized I didn't understand why I believed what I thought I knew," he remembers. "It came as a profound blow to my ego. What did I really know? What did I really understand? I made myself a promise never to put others in the same situation but to help them realize what understanding means."

Arons, now 61, left Amherst for Seattle in 1968 specifically to develop the course that became Physics 101. He had long been a vocal critic of traditional physics education, and UW's Ronald Geballe, then physics chairman and now dean of the graduate school, challenged him, in Arons's words, "to put up or shut up." Arons accepted the challenge, moving from a small, select liberal arts college to a diverse, urban university, now with 36,000 students.

UW has given him "wholehearted support," Arons says, and his efforts have gained wide recognition. He has been awarded the University's Distinguished Teaching Award and the American Association of Physics Teachers' prestigious Oersted Medal. Last August the Oxford University Press published Arons's text based on Physics 101, *The Various Language: An Inquiry Approach to the Physical Sciences.*

The inquiry approach is now a part of several UW physics courses, including an in-service course for Seattle area schoolteachers and a one-year course both for students preparing to teach secondary school science and for 101 students seeking a second year of inquiry-oriented physics. Major responsibility for these courses belongs to Lillian McDermott, who has worked with Arons since 1970. They are assisted by a half dozen graduate students, several of whom are pursuing PhDs in physics with dissertations in educational research—a new program that is one of very few of its kind in the United States.

Those who adopt Arons's inquiry approach find they must work to avoid lecturing. "You have to break yourself of always explaining everything," admits George Farwell, a faculty member teaching the regular section of Physics 101 this year. Graduate assistant Jim Evans agrees. "Sometimes you find yourself yakking away, and you feel awful," he says. "The important thing is to leave the student with a problem that is difficult but not insurmountable, one you're pretty sure he can solve if he tries." Evans says he will use aspects of the inquiry method wherever he teaches in the future.

But the method is time consuming. The full year of Physics 101 covers only about as much material as a half-year lecture course. Yet Arons maintains that the typical lecture course is a "verbal marathon" that students struggle to endure, gaining little real understanding. Learning to think takes time, he says, time "to explore, to test, to manipulate, to suggest hypotheses, to follow trails to dead ends and retrace steps, to make mistakes and to recognize and correct them without being punished for being wrong." Arons's first advice to other teachers is, "Cut back on the volume and pace of subject matter you're ramming down students' throats. Give them a chance to reason, to think, to absorb."

The inquiry approach demands a good deal of staff time too. Because students need help with their individual work, there must be at least one teacher and preferably more for every 20 to 30 students. What can be done by a teacher with sole responsibility for a class of 500? Arons admits he has no magic solution. With a large class and little lab time, he says, limited improvements can be made by lecturing slowly on a very limited number of topics and using many demonstrations, take-home observations and exercises, and test questions carefully designed to probe for understanding rather than recognition of names and technical terms.

G.S. Monk, A UW mathematician, applies Arons's inquiry method to large calculus classes. Monk trains his teaching assistants to encourage inquiry in quiz sections, which become the core of the course. "The lectures recede into the background to give students an overview," Monk says. He adds that Arons and McDermott "are both gifted teachers," but "a lot of others could do something similar."

UW faculty have adapted the inquiry method to other fields, and physical science courses patterned after Arons's Physics 101 are offered at the Universities of Michigan, North Carolina, and Houston, Purdue, Fairleigh Dickinson, Montana State, and Eastern Washington State College. Teachers involved seem pleased with the results. At Montana State, physicist Larry Kirkpatrick teaches an inquiry-oriented physical science course under less than optimum conditions: The course has an enrollment of 120, divided into four sections—all led by Kirkpatrick with no assistance. Though he is less able to give students individual attention, he is sold on Arons's inquiry approach. "The important thing" for students, Kirkpatrick says, "is to learn how to do the reasoning involved in science and to understand their own reasoning well enough to explain it to others." ■

Learning experience:
Physics for Teachers. Designed for elementary school teachers, pre- and in-service, and for students satisfying general education distribution requirements. No prerequisites. Enrollment: 30 to 40 students in each of two sections.

Other descriptions:
Arnold Arons, "Toward Wider Public Understanding of Science," *American Journal of Physics* 41, June 1973. See also Addendum, *American Journal of Physics* 42, February 1974. "Cultivating the Capacity for Formal Reasoning: Objectives and Procedures in an Introductory Physical Science Course," *American Journal of Physics* 44, September 1976.
Syllabus of the course and detailed discussion of pedagogical problems are to be found in the textbook *The Various Language, An Inquiry Approach to the Physical Sciences.* New York: Oxford University Press, 1977.

Similar programs:
University of Houston (R.H. Walker), Montana State University (Larry D. Kirkpatrick, N.M. Rugheimer), Purdue University (Floyd Nordland), Fairleigh Dickinson University (George Courville, Sherman Jaffe, Joseph Quattrone), Eastern Washington University (Robert C. Gibbs), Mississippi State University (Marlene Milkent), University of Michigan (Patricia Autry Heller).

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IT'S STUDENT AND COMPUTER, ONE ON ONE

by Sally Valente Kiester

If computer theory is based on physics, why shouldn't physics teaching be based on computers? At the University of California at Irvine, Alfred Bork, professor of physics, has answered this query emphatically: It should. Each quarter, 300 Irvine students study introductory physics at a computer terminal, watching questions form on the screen and tapping out answers. The only resemblance to a conventional course is a weekly summary lecture, a recommended textbook, and a written final exam. While students have frequent contact with Bork and unlimited access to teaching assistants, it's student and machine, one on one.

Bork, a slight, bald figure whose chest-length gray beard makes him look like an unobtrusive Old Testament prophet, considers the marriage of computers and physics instruction an ideal union. "Students learn best by interaction," he says. "Computer-based instruction affords that opportunity on an individual basis. A lecture to 300 persons is totally depersonalized. A textbook must seek a common denominator for all readers. But the computer is so flexible that each student has a unique educational experience. Each one can follow his own pace and concentrate where he needs to."

Physics 3, one of the courses developed under Irvine's Physics Computer Development Project (PCDP), is a three-quarter course primarily for premed juniors and seniors who need the credit from one physics course for medical school admission. The first quarter is totally devoted to computer instruction; the second features a half-and-half mix of computer and traditional work; the third moves on to work independent of the computers. Another course, Physics 5, is a five-quarter, in-depth version for physical science and engineering majors. Both courses are calculus based, stress problem solving, and cover the traditional ground of mechanics and the science of motion, electromagnetic theory, and the atomic and nuclear aspects of modern physics. Every 10-week quarter is divided into 8 units, each with computer dialogues and quizzes.

Though it is only entering its ninth year as a formal program funded by the National Science Foundation, PCDP's roots actually go back much further. In 1958 Bork was teaching at the University of Alaska in Fairbanks when that school purchased a small, "primitive" computer. As a physicist, Bork was fascinated by it; as an educator, he quickly saw its teaching potential. He devised a small experiment with his physics classes in which computer programs reinforced classroom discussion.

Four years later Bork went to Harvard as an NSF science faculty fellow. Despite his Alaska experience, he had no idea how widely computers were used in instruction. He wrote to other colleges and to manufacturers. "Someone at IBM wrote back and said they didn't know too much about the subject," Bork recalls, "but they had heard that some teacher up in Alaska was experimenting with the idea."

Bork moved from Harvard to Reed College in Portland, Oregon, then after four years returned to Harvard to develop college computer materials and to work on a high school physics course. Meanwhile Irvine had been established as one of three new instant campuses in the growing UC system, with a heavy emphasis on computers. Through the influence of Ralph Gerard, first dean of graduate studies, "Computer U" had a computer even before it had a campus and was granted state legislative funds for experiments in computer-based teaching. Not surprisingly Bork was quickly recruited for the faculty. He started immediately to develop computer-based courses, but full adoption was delayed until the University changed computers in 1974. Today 57 percent of Irvine's students use computers during their four-year program, and Irvine ranks as one of the most computer-committed institutions in the country.

The current program is based on the Keller plan, or personalized system of instruction (PSI), but with unique refinements. Like PSI, the course allows students to study at their own pace and encourages them to review each unit until they demonstrate mastery. Bork delivers a weekly lecture and assigns a text—"Some students feel uncomfortable without a book or lecture," he says—but since the class may be involved in as many as eight different units midway through the course, neither print nor speech plays a prominent role. Instead, the student visits one of UCI's 25 graphic terminals in 3 locations, taps out a private code number, and works alone or in a small group. Studies show that the average student stays 25 minutes per sitting and totals about 2 hours a week.

In the computer room in Irvine's physical science building, students wait their turns at the Sigma 7 computer, the machine to which the physics courses are keyed. Those seated at the terminals watch as swift blips of light move slowly across the screen and form into the shapes and designs of physical phenomena. "To an outsider I guess it looks like we're playing Pong," says Eric Thompson, a senior biology major who has become so immersed in computer instruction that he now helps prepare new dialogues. "But you really learn this way. Electric fields described in a book are difficult to visualize. When you can direct an electron through a field to a tar-

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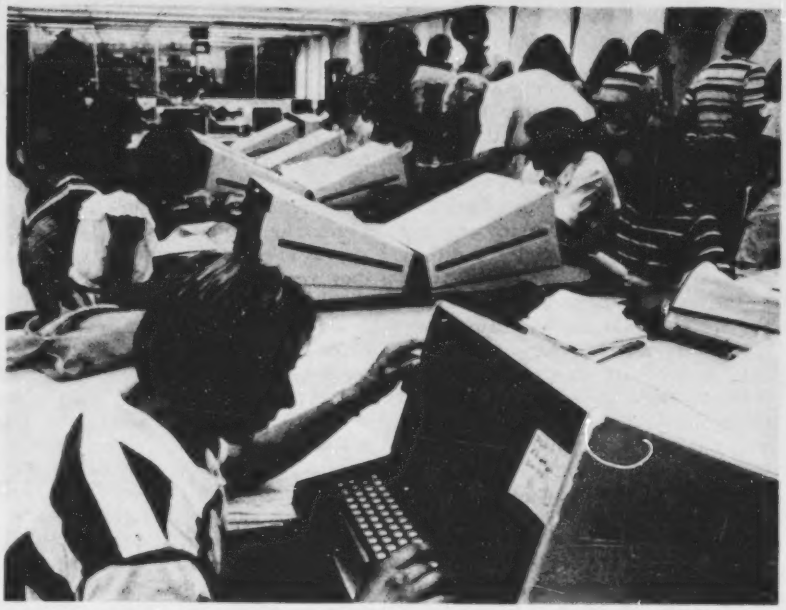
get you understand what it's about."

Although computer-based instruction may be thought of as passive and word oriented, Physics 3 is neither. Actual demonstrations appear on the screen and students manipulate the images so that they learn the principles by direct experience. Each terminal can project a set of cross hairs that can be moved by turning a knob on the keyboard. These enable the student to locate points on the screen or to indicate choices among phenomena. In an orientation dialogue about plotting coordinates, for instance, the student is asked to identify each point that indicates zero velocity. He simply moves the cross hairs to each point, punches the return, and the computer records his answer.

An example of how Physics 3 allows students to explore and reinforces their answers is demonstrated in the dialogue on magnetic fields, written by Bork and Arnold Arons of the University of Washington. First a simple circuit consisting of a dry cell, a light bulb, and a switch is sketched on the screen. A compass is placed beside the wire. The words "Now we close the switch" appear. The bulb lights; the compass needle shifts. "The lighted bulb indicates current," the computer prints. "Are you aware of what else happens in this system?" When the student replies that the compass points in a new direction, the computer immediately responds: "Yes. The compass points in a new direction. This physical effect was first observed by the Danish physicist Hans Christian Oersted in 1820. The discovery created a sensation and precipitated a line of investigation similar to the one we follow in this dialogue. Previously magnetic effects were known to be associated only with permanent magnets and not with electrical phenomena."

Next the computer shows in cross section a wire through which current is passing. The student is invited to use the cross hairs to situate a small compass in the region surrounding the wire. When he chooses his point and presses the F (for finished) key, the computer sketches in a compass with the needle properly positioned. Then the student is invited to choose additional locations for the compass. The computer adds more compasses and calls the student's attention to the pattern that has formed; when the student responds that he sees a counterclockwise circle, the computer congratulates him and moves on.

"We want to see more complete details of the program," the computer prints. "Consider your first compass location. We draw a line from this location to the wire. How would you describe the orientation of the compass needle with respect to the radial line?"



On line at Irvine's Physics Computer Development Project. Below: Alfred Bork.

"It's perpendicular," the student responds. "Good," the computer enthuses. "The compass pointed at a right angle"—tracing the intersection of the lines—" to the radial direction. We can check this observation with another point. Point to one of your other compass locations." Manipulating the cross hairs, the student selects another compass, then presses the F key. The computer instantly flashes another perpendicular from wire to compass, then duplicates it at each location until the field appears as a pattern of spokes and the lesson is thoroughly reinforced.

To Bork, graphics are at the heart of his course; he believes his early attempts at computer-based instruction were less successful until the University acquired a computer with greater graphic capability. "Whether or not a picture is worth a thousand words," he says, "there is no question that often we can get an idea through a picture in a way that is either an alternative to verbal and numerical ways of approaching it, or a view of the information that is simply not available in other ways."

The dialogues also employ typographical pyrotechnics: Varied letter styles, underscores, boldface, and capitals catch student interest and make emphases. Flexibility is also important. The computer will accept most variations on the correct answer and respond accordingly. It also is programmed to reply to the most common of incorrect answers, and after a pattern of mistakes will direct the student back for further study. The responses are always enthusiastic and supportive. "First-rate!" may be the comment after a correct answer. Or "Right on!" At one point, the student is told, "RELAX."

Each student takes eight or more quizzes per quarter—at least one per unit—and may decide for himself when

he is ready for them. The quizzes are taken and graded immediately "on line" via a pass/repeat system. The student is given 40 minutes to complete the questions. If he does not achieve a satisfactory grade, he may try again the following day. He is allowed four chances per quiz before the computer refuses further testing and refers him to the instructor for help. With its flexible features, the system can offer each student a unique examination.

The system's storage bank also allows the student—and the instructor—continuous feedback on progress. By punching the student's code number either may obtain an up-to-the-minute report on the number of dialogues completed and tests passed. The student also is told his current approximate grade, based on points for each completed dialogue and quiz, plus bonuses for completing them before a deadline. Bork also can learn how often the student visits the computer and how much time he spends there, so that he can step in when a student is procrastinating.

PCDP has made a strong effort to avoid a pitfall of PSI; since it functions on self-discipline, it tempts students to delay until they are too far behind to catch up. At the first class, Bork warns of these problems and urges students to map a course strategy. Notes the course guide: "THE GREATEST PROBLEMS with PSI courses occur for students who do not construct and carry through such plans for themselves, but only carry out a particular week's work under pressure." Bork suggests that students either set and maintain a standard pace, move ahead of the pace and use the time for other activities, or plan their physics study around other courses.

"We use the carrot and the stick," Bork says. "The carrot is in the form of bonus points for completing quizzes before an established deadline. The stick consists of a rule that you cannot complete more than four units in the last three weeks." The aides and the instructor are on call daily, and students needing special assistance can leave messages for Bork in the computer.

Overall, students praise the system. "It's much more of a learning experience than either a textbook or a lecture," says Sylvia Noronha, a senior biology major. "You become almost mesmerized by it." But the students are often annoyed by technical problems. "Sometimes you have to wait two hours for a terminal," complains Stephen Simon, a premed student. "And the computer breaks down an average of once a week." Even waiting in line doesn't guarantee access to the computer. "The system is so overloaded that it's a real lottery," says Eric Thompson. "When you get a terminal you have to wait until somebody logs off, and then you come on simply because you have started at that same split second." Terminals are available to students from 6 a.m. to 1 a.m., but even at 11 p.m. lines sometimes exist, especially at quarter's end. Commuters gripe that they spend long hours at the campus simply waiting for a terminal.

The Physics Computer Development Project has received national attention, but it has been less successful in winning support of other members of the physics department. William Parker, who also teaches introductory physics, sticks to lectures. "We have to provide a variety of mechanisms for learning, but I look to the computer to supplement the lecture, not replace it. It cannot provide some of the subtleties, some of the enthusiasm, some of the elegance, some of the sophistication about the subject that a student can obtain from the human presence." This winter Parker and Bork will team teach Physics 5; Parker will lecture, and Bork will use computer-based instruction.

Learning experience:
Introductory Physics: Several different courses, some self-paced. Some calculus. Enrollment in each: 300.

Other descriptions:
"The Physics Computer Development Project," *EDUCOM* 10, No. 4, Winter 1975.
"Modes of Computer Usage in Science," *T.H.E. Journal*, 1976.
"Interactive Computer-Based Testing," *Journal of College Science Teaching* 7, No. 1, September 1977.
"Course Management System for Physics III at Irvine," Proceedings of 1977 Conference on Computers in the Undergraduate Curricula. CCUC8, Michigan State University, June 20-22, 1977.
A complete list of published papers and internal documents is available.

Similar programs:
Programs have been sent to about 25 other institutions. The software has been converted to another computer by John Herman, Western Michigan University.

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Although such studies have not been conducted at Irvine, Bork quotes research elsewhere to indicate that computer-based instruction costs only two thirds as much as conventional teaching and that students of matched ability do equally well whichever system is used. His own experience indicates the method is particularly effective for the average student, because he is able to review the material many times until he has mastered it. Bork acknowledges some of the technical problems—students complain that typing errors often compel them to repeat dialogues or even yield a wrong answer—but says these bugs are being worked on.

Michael Scriven, professor of philosophy at Berkeley, last spring conducted a formative evaluation of the PCDP. Relying on interviews with students and using feedback from the computer records, Scriven suggested a battery of improvements, including rewriting certain dialogues to improve clarity and revising the point system so that students were no longer penalized because of delays in reaching a terminal. In accordance with Scriven's recommendations the written final has been made mandatory in order for a student to receive an A; B has become the highest grade obtainable on the basis of on-line quizzes alone.

Meanwhile, the ripple effect has carried Bork's influence beyond the physics department. A computer-based introductory mathematics course has been inaugurated at Irvine, and computer-based units are included in courses in chemistry, ecology, anthropology, and medicine. The physics professor believes that the spread will become even greater with wide adoption of minicomputers. The present cost for computer equipment is about $300 per student, he says. Newly available technology can reduce it to $30, and with current home computers that operate without sophisticated graphics, it comes down to $3 per student. The economics of it all someday will make computer-based instruction irresistible.

For many faculty, including physics faculty, that is a day to be wished for, Bork says. "There will be many benefits from using the computer as a learning device. Routine activities like record-keeping will be left to the computer. Faculty can spend more time working individually with students. Surely this will seem more rewarding and exciting than lecturing to a crowd of 500. Used properly, the computer can lead to a more humanistic approach to education." ■

First Aid for Physics

Holding forth at tandem blackboards in a lab at the University of Maryland in College Park, twins Milton and Zaka Slawsky tutor introductory students who are confounded by the mysteries of physics. The Slawskys and fellow physicists William Wineland and Joshua Stern—senior citizens all—staff the Slawsky Clinic for Calculus-Based Physics Therapy on a volunteer basis.

Three years ago Zaka, who taught off-campus graduate courses while chief of physics research at the Naval Ordnance Laboratory, was approaching retirement; he was asked to fill in at College Park when a professor running a math workshop for physics students left the University. Zaka and his brother Milton, who had just retired as director of physics at the Air Force Office of Scientific Research and was itching for intellectual nourishment, decided to take over the project as a team. The two soon realized the workshop wasn't directing first aid to the right wound: While faculty felt nonmajors were falling down in physics because they had been ill prepared in math, the Slawskys disagreed. Math skills could be acquired with practice; what students really needed was to learn to express ideas mathematically. Accordingly, the clinic's function was adjusted: Now the emphasis is on understanding and theory. "We tell students they don't have to memorize a thousand different formulas—just learn a few basic principles and the rest will fall into place," Milton says.

The clinic is open two days a week from 10 a.m. to 3 p.m. and three days until 6 p.m. Students from the University's five introductory courses come primarily of their own volition. Written announcements about the clinic are handed out with course schedules and the Slawskys take the stage during the first class lectures to announce their services. At the same time they hand out signup sheets so students can note their free hours and give the clinic staff a head start on accommodating all seekers. Then the tutors make up a clinic schedule showing when each course will be covered. Usually four or five students are present at a time (though three are considered ideal).

Initially about 350 students sign up, but "fortunately," Milton says, "they don't keep coming. About a third settle into regular visits and that's a comfortable number." The Slawskys each put in 25 hours weekly; Wineland contributes 24 and Stern 15. Most students make two or three visits a week, and all are encouraged to stop by whenever they need to. The clinic does, however, receive as many who are doing A work in physics as C and D work; the better students come, Milton explains, because they want enrichment and would like to guarantee top grades in the course.

The project is an inarguable success: Milton reports that his clients earn 20 percent more A's and as many more B's than students in the same courses who don't avail themselves of the clinic's services—and none have received D's. Moreover, students in one course who were scoring about six points below the average on exams before tutoring leapt to seven points above it after the staff had worked its wizardry.

Milton, who used to teach University of Maryland graduate courses at the Bureau of Standards, expresses some dismay at what he views as one reason for his booming clientele: a downplaying of quantification in physics classrooms. "Physics is the most difficult subject on campus," he asserts. "It's different from all other courses in that it's the only discipline fully committed to quantification. So efforts to translate it are no good—ordinary language is inadequate. Physics must be taught in mathematical language."

Zaka, however, emphatically denies that the number of students seeking extra help in physics has anything to do with teaching methods. "The trouble is that although we're in a technological age and science is half our culture," he says, "most people aren't exposed to a mathematical way of speaking until too late. That's why volunteer tutoring is a must; no university could afford to provide the attention necessary to handle students who've never had to express an idea mathematically."

The Slawskys have been invited to speak to the American Association of Physics Teachers (AAPT) in San Francisco, and they are excited about the future of tutorial clinics staffed by volunteer senior citizens. "Don't call us retirees," admonishes Milton, "call us annuitants. Because if we had no income we wouldn't be able to do this." He feels people his age are best suited for the tutoring role because of the broad perspective they've acquired from dealing with physics in nonacademic contexts. "What we have left is wisdom, patience, and experience," he says. "Professors in the 30 to 50 age bracket should be doing the creative work, the researching and lecturing. Our interest is developing pedagogical techniques and strategies so we can talk to people who've never heard of physics."

Adds Zaka, "Retired professors often think tutoring is a comedown—but it's more individual, more rewarding. Unlike a regular faculty position, being a tutor is stress-free; there are no exams, no grades, no acting like God. All you have to do is help kids." He also points out that "tutors aren't substitutes, they're supplements; we aren't trying to do a professor's job at no pay. We only treat 10 to 15 percent of the physics population; the rest are treated by the faculty." Finally, Zaka warns, "Any institution that wants to set up a clinic like ours should talk to us. Tutors must go easy. They can blunder into a university and upset the faculty. This is a delicate matter when budgets are being slashed and people are jittery. You can't go in with big boots."

If the Slawskys are objects of gratitude for throngs of perplexed physics students, they are also giving senior colleagues food for thought: After they described the clinic at a local AAPT meeting, six professors thanked the twins for helping them decide what they're going to do when they retire.

For more information: Milton Slawsky or Zaka Slawsky, Department of Physics and Astronomy, University of Maryland, College Park, MD 20742, (301) 454-3401.

PHYSICS AT RPI: CAPTURE THE MIND AND STRETCH IT

by Jerrold K. Footlick

Students call it "The Magic Show" and it's not the kind of class they are likely to fall asleep in. The lecturers fire cannons and set off rockets that pound at the eardrum; they dazzle the eyes with whirling bicycle wheels and bright overhead projections; they delight the ears with melodic gases. As the weeks pass, the effect is to capture the mind—and stretch it. This is introductory physics at Rensselaer Polytechnic Institute in Troy, New York. It is challenging, but at the same time as pleasant an experience as a difficult course is likely to be.

Over the past two decades, RPI has developed one of the nation's outstanding programs in basic physics. The recipe for this success is marvelously simple: The course throws together first-rate students, an enthusiastic faculty, an excellent text, fine laboratory facilities, and brilliant audiovisual techniques. The obvious question is how and why these elements came together at RPI, and whether they will work in similar fashion elsewhere.

Not that the RPI program is perfect, at least judging by the faculty's constant efforts to change it. "We are always stirring the pot," says Robert Resnick, whose heady enthusiasm powers the system. "We listen to student complaints. We're always trying to maintain a sense of participation. We try to infect students and faculty so they will be creative and consider new ideas." Everyone does seem to share. The textbook is written by Resnick, the audiovisual materials are largely produced by RPI faculty, and even the undergraduates help in making films and videotapes.

In a sense, RPI is lucky. A special blend of people and events has achieved an interface, as the physicists might say, to make the program what it is. First of all, RPI's undergraduate physics program benefits because the school itself has been historically an undergraduate teaching institution. Founded in 1824 to train engineers, it still has the largest undergraduate engineering program of any private university in the country. Since engineering was always the one discipline in which a person could become a professional with no more than a baccalaureate degree, the school did not need to emphasize graduate work as comparable institutions did. RPI's professional training programs have expanded dramatically since World War II, yet the undergraduate tradition remains the keystone of the institution.

And the students are worthy of the tradition. They earn an average score of nearly 1,300 on the College Boards, and many have earned advanced placement credits in high school. RPI counts as its principal competition for students the Massachusetts Institute of Technology and the Ivy League universities, especially engineering-strong Cornell. The physics faculty is particularly oriented toward teaching. Although it produces its share of professional research, the department has also authored collectively nearly two dozen textbooks. Notably, two tenured professors hold only master's degrees; they gained their senior status on the strength of their contributions to the teaching program.

Timing made a difference too. Just when the launch of Sputnik alerted Americans to the need for better science education, RPI physics chairman G. Howard Carragan began to assemble an expanded department. In 1956, Resnick arrived from the University of Pittsburgh, where he and Pitt colleague David Halliday had started to construct a new textbook. With the help of a grant from General Electric, Resnick began to reform the introductory course. He used RPI as the laboratory for the text. With the cooperation of his new associates, he tested versions of the book over the next five years, and the result, Resnick and Halliday's *Physics*, has become one of the nation's most successful textbooks in any subject. It has sold nearly two million copies and has been translated into twenty-two languages, including Russian, Chinese, and Arabic.

The product of all these factors is an introductory physics course that spans two years. The first covers mechanics, wave motion, sound, thermodynamics, and begins electromagnetism. In the second year, students finish electromagnetism, move into optics, and tackle relativity and basic quantum physics.

The first three semesters are required of all RPI freshmen and sophomores, except for the roughly 10 percent of the class who will be architecture and management majors. This smaller group takes a less intensive physics course that lasts one year. The fourth semester of the principal course is required only for physics and mathematics majors, though many science and engineering students choose it as an elective.

The entire 28-person department

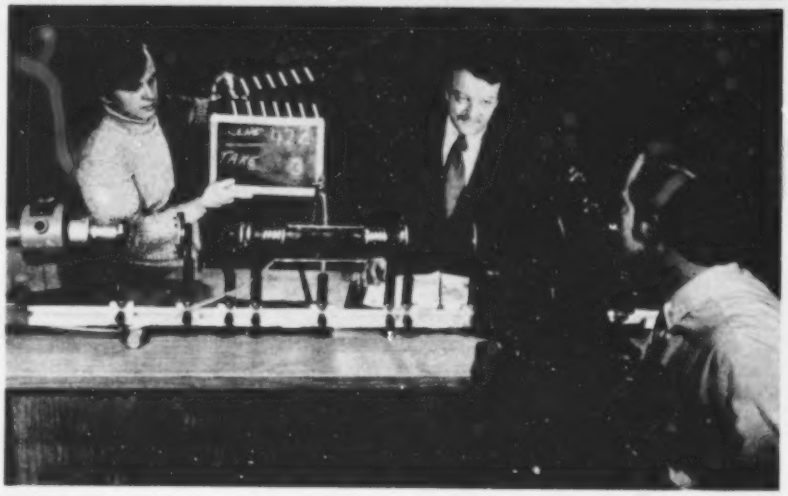
JERROLD K. FOOTLICK is a general editor for Newsweek and formerly the magazine's education editor.

shares in teaching the introductory program each year. More than 900 students, split into two groups, are enrolled during the first three semesters. Three lecture sessions are scheduled every two weeks, with four different professors giving the lectures in the four different semesters. But every faculty member conducts one or more of the twice-weekly recitation sessions for about 25 students each. They use the recitation periods to work problems from the textbook, give tests, and answer the students' questions. Graduate teaching assistants take the remainder of the recitation groups and also conduct the laboratories, three hours once every two weeks, with about eighteen students in each.

While most of the students follow this primary lecture/recitation/laboratory model, the department also takes care of special students. About 50 freshmen who come to RPI with shaky backgrounds in physics are enrolled in "X sections." They spend more time in recitation periods and often receive tutorial assistance to help them keep pace. At the other extreme, about 25 to 50 students every year qualify for honors sections. And about 25 others elect self-paced physics, in which they set their own schedules, taking regular quizzes to establish that they are coping with the load.

A physics course might be considered fundamentally the same wherever it is taught, but RPI decorates its program in remarkable ways. The emphasis on audiovisual materials is almost overpowering. Every lecture includes from three to seven demonstrations, sometimes intended to hammer down the same point several ways. "We want to show the students that physics is something one can see, alive and working," says Alan Meltzer, an astronomer who is giving the third semester lectures this year. All the lecturers use overhead projection, films, videotapes, stroboscopic lighting, shadow projections, and slides in a spectacular array. The giant lecture hall holds 11 television monitors and 3 big screens so that no student is far from the action. "We not only want to clarify the subject," says Resnick, "but we want to interest the students and motivate them."

The wizard behind much of this audiovisual extravaganza is Harry F. Meiners, who combines an inventor's curiosity with a garage mechanic's ability to put things together. Not only has Meiners directed the construction of much of the school's demonstration ma-



Walter Eppenstein (above) illustrates the addition of waves using an overhead projector. Alfred Leitner works with associates to prepare a film on physics instruction.

Harry Meiners performs a demonstration in an RPI lecture hall. After lectures, some of the more inquisitive approach with questions.

terial, but he has traveled the world tracking down notable physics teaching experiments. The result is a two-volume, 1,400-page treatise called *Physics Demonstration Experiments*, which Meiners edited. It explains how and why demonstrations should be used, and in words, diagrams, and pictures illustrates hundreds of demonstrations. Some of the material that Meiners has developed, such as a microwave diffraction experiment, is sold not only in the U.S. but in India and South America. He and Resnick are producing instructional color videotapes on subjects ranging from Brownian Motion to Faraday's Law.

Meiners is one of the two tenured faculty members without a doctorate; the other is Walter Eppenstein, whose contributions include the miniaturization of experiments combined with overhead projection techniques. In effect, the overhead projector replaces the slide projector and the blackboard, but because of Eppenstein's imaginative treatment, RPI uses the device differently than most institutions do. He has designed color transparencies and overlays that are at once complex and lucid, and a text to accompany them. In addition to showing diagrams and pictures, Eppenstein works miniaturized experiments on the projecting surface, where their movement is flashed to giant size on the lecture room screens.

Eight years ago, RPI recruited Alfred Leitner, a leader in creating films for physics courses, from Michigan State University. He made the change, Leitner says, because "teaching gets a good deal of attention at RPI." In producing his films, which are available to physics departments across the nation, Leitner concentrates on materials and experiments that are difficult or costly to assemble and repeat—Liquid Helium II: The Superfluid, or Introduction to Superconductivity, for instance. "We don't worry about glamour because we don't have that kind of equipment," says Leitner. "We want to show the experiment, what it does, and how it does it." The result, backed by a carefully weighed script, may or may not be glamorous, but is certainly vivid.

Yet even when an introductory course is vivid, students become impatient with the groundwork and want to know what's going on at the frontiers of the discipline. They may not be ready to absorb all the hypotheses in detail but they can at least peer into the future and RPI's faculty has thought of a way to keep them happy. Each semester, the physics department offers a group of special courses. They are each worth one credit hour, meet once a week, and are graded pass-fail. All a student must do to pass is to attend most of the lectures and perhaps write a paper. The classes are intended to be learning experiences, but they are also fun, judging by student response.

Alan Meltzer gives four such courses that attract more than 300 students apiece. One is Quasars and Cosmology, which traces the discoveries of the 1970s in astronomy and discusses exploding galaxies, stellar evolution, pulsars, and black holes. The other, A Spaceman's Tour of the Solar System, surveys the data collected from manned and unmanned probes to the moon, Mars, and other planets, and speculates on future space exploration. Musical Acoustics investigates the physical characteristics of musical sound, the effect of an architectural environment on perception of music, and the tonal qualities of musical instruments. Approaching Zero Kelvin surveys current research at temperatures near absolute zero and the phenomena of superfluidity, superconductivity, and magnetism.

It's not unusual for college professors to become so enamored of their own efforts that they forget about their real purpose—the teaching of students. RPI seems to have avoided this trap. Not having experienced a college-level physics program before, the students may not know precisely what is special about theirs, but they know they like it. They call the lectures "entertaining" and "fantastic" and find that the demonstrations

Robert Resnick works with a graduate student on a program investigating the uses of computers in physics education.

make the work easier. If they have a general complaint, it concerns the laboratory sessions, which often appear dull and elementary to them after what they witness in class. Student appreciation sometimes depends, too, on the luck of the draw—how good a teaching assistant they get in their recitation or lab section.

Remarkably, hardly any student has much criticism to offer about his professors. "They expect a lot," says one sophomore, "but a good student can deliver, and we are supposed to be good students." What RPI students like most is the fact that they can reach out and talk to their teachers. Every professor must be available to introductory students at least two hours a week, and most spend much more time with the door open. The faculty will speak with any student who drops by. "You can always find someone to answer a question," marvels one freshman. "They're always there."

It is not only RPI's students who benefit from its physics department's dedication to teaching. The textbooks, demonstration materials, and tapes and films have been disseminated nationwide, and the Institute's influence on physics education programs has been extensive. RPI served as the focal point for development of the PSNS course—Physical Science for Non-Scientists—which sets out to prove that no student need be overawed by science. The course is offered at teachers' colleges to students who don't want to specialize in the sciences—who, indeed, may fear the discipline but will be teaching it to elementary and junior high school pupils. RPI has also hosted many student and faculty science seminars during the summers. In the last 20 years, it has received nearly $2 million in private and government grants to fuel its physics education programs. Currently, under a Texas Instruments grant, Resnick is directing preparation of a handbook for students and faculty on the uses of the hand-held programmable calculator in improving science and engineering education.

Learning experience:
General Physics, calculus corequisite. Enrollment: 1000 freshmen and 900 sophomores in engineering and science.

Other descriptions:
No complete description available. Specific inquiries welcome.

Similar programs:
MIT, California Institute of Technology, Carnegie-Mellon, University of California (Berkeley), Cornell, and others.

Contact:
Robert Resnick, Department of Physics, Rensselaer Polytechnic Institute, Troy, New York 12181, (518) 270-6322.

As the Institution's fame has spread, so also has the reputation of its physics faculty. In 1971, Meiners received the Robert A. Milliken Lecture Award, given by the American Association of Physics Teachers (AAPT) for notable and creative contributions to the teaching of physics. Three years later, the AAPT granted Resnick its highest award, the Oersted Medal, for his myriad contributions to physics instruction and for the "quite personal influence he has radiated for so many years." And the physics faculty is not without honor on its own campus. In 1971, Resnick received RPI's Distinguished Faculty Award, the highest honor that the Institute's faculty can bestow on one of its members.

Because of what RPI has always been, and what it is today, the physics program may well be something that other institutions cannot readily duplicate. But the materials and the curriculum it has developed are there for everyone to observe. And when all the textbooks and the machinery and the films are set aside, RPI's physics department still has something else to offer: professors who care about teaching. ■

LURING THE DISINTERESTED TO HARD-CORE PHYSICS

by Henry Weil

Sooner or later, all teachers face students who are required to take their courses but who have no appetite for the subject matter. Teachers learn to recognize the glazed eye, the hunched shoulders, the desperate search for an answer whenever questions penetrate a reverie. Those teachers who can remember their own school days are usually sympathetic. Still, they must resign themselves to disinterested students (who believe—erroneously—that their teachers don't recognize them), and students must learn to endure courses they'd never take if they had the choice. But there are some teachers who try to reach such students. And a few of them even succeed. The faculty in the physics department at Ohio State University in Columbus, Ohio, belong among those few.

Ohio State was chartered in 1870 as the Ohio Agricultural and Mechanical College. From the first, enrollment at OSU was available to any student, regardless of social context or economic circumstance. Today its highly centralized Columbus campus handles approximately 50,000 students, more than 35,000 of whom are undergraduates.

Before the 1970s, OSU's physics department, headed by Leonard Jossem, offered two full-year introductory courses: one without calculus for biology and health science students and another with calculus for engineering and all other science students. In addition, the department offered a third introductory course, two quarters long, intended for nonscience majors hoping to teach in elementary schools. None of these options appealed very much to students in sociology, history, or political science. "There was a clear need," explains Jossem, "for a one-quarter-long, five-credit-hour course."

So a committee was appointed to consider the challenge. The group comprised members of the department's faculty of 43, its graduate teaching assistants, and one undergraduate physics major. Eventually the committee evolved Physics 100.01.

The ideal course, the committee decided, should not apologize for hard-core physics, substituting environmental sociology for scientific essence. At the same time it was clear that another introductory survey would be no improvement on the courses already available. Better to provide students with a limited number of concepts that carried a wide range of resonances both in everyday life and throughout the discipline of physics. Best of all to fire the students' natural curiosity about common phenomena around them.

The department's chief commitment, however, was to a course that would provide an intensive, hands-on laboratory experience, in which students could discover physical principles for themselves, using familiar objects (toasters, pulleys, pianos) or objects that are at least familiar by reputation (Geiger counters, laser beams, solar cells). Only a few concepts would be presented during a single lab session, and students would be prepared for each new concept with reading assignments.

Math, the bane and bugbear of all open admissions colleges, was to be kept simple: no calculations more demanding than multiplication and division. "There's an awful lot in physics," observes Jossem, "that you can understand without getting into complex mathe-

HENRY WEIL is a free-lance writer who at one time was an assistant professor at Union College where he headed the drama program.

matics." But at the same time, the committee resolved that students should be given no answers that would prove wrong if pursued to a higher level of sophistication in a more advanced course.

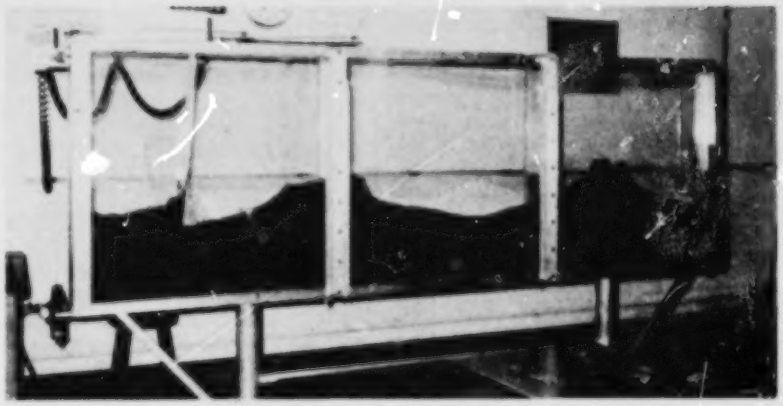
The committee chose Vibrations and Waves as 100.01's topic, to cover music, speech, hearing, architectural acoustics, ocean waves, light, color, and interference, concluding with holography. The course took about a year to design, and once it was in blueprint the physics curriculum committee and the University curriculum committee quickly gave their stamps of approval. Clearly, however, the acceptance that mattered most would have to come from disinterested students.

When the course was first offered in the fall of 1972, the physics department anticipated an enrollment of perhaps 50. Instead it got 210. By spring, enrollment had jumped to 335. Soon, to accommodate the demand, the department had to equip a second laboratory, which could be used simultaneously. Each room was in use almost constantly, and enrollment had to be limited to 450 (determined by the school's computer on a first-come, first-served basis, followed by a preferential waiting list). The course is now oversubscribed every quarter—often by a factor of two.

By January 1973, it was clear not only that the committee's concept had been cleanly on target, but also that there was ample demand for an alternative version of the same course. For a second option, the committee designed Energy (100.02) —not a focus on environmental issues, but a serious treatment of the specific physical properties and principles of various kinds of energy (such as electrical, magnetic, thermal, nuclear, and radiant) as well as the problems of storage and conversion. Inevitably, the environmental dilemma is discussed late in the course, but only after students are given a full theoretical background. Enrollment, as eagerly sought as for Vibrations and Waves, is limited to 330. The physics department has simply run out of space and staff. It can support only one classroom for Energy in addition to the two for Vibrations and Waves.

There are no prerequisites for either version of the course. Each meets five hours per week. During one of those hours, all sections of each version meet together for a lecture or to hear guest speakers or view films of phenomena impossible to demonstrate (tidal waves, the collapse of the Tacoma-Narrows bridge). The remaining 4 weekly hours are divided into 2 two-hour lab sessions. Classes are broken down into sections of no more than 30 students, led by an instructor who might hold any rank from graduate teaching assistant to full professor.

Students group themselves around tables on which a tangle of equipment, both probable and improbable, is arrayed. The instructor gives a brief description of the principles involved in the day's experiment and suggests appropriate procedures. As the students operate the equipment, the instructor wanders from table to table to see that everything is proceeding as it should—and to find out what's wrong when it doesn't. When all of the students have noted the physical phenomenon in question (piano strings vibrating sympathetically, a motor running on the energy radiated from an ordinary light bulb), the instructor goes on to discuss



Students in Energy gather around lab tables. The demonstration wave tank (12' x 4') is used in Vibrations and Waves to show traveling and standing waves, as well as the "breaking" of waves.

Learning experience:
Physics and Man. Two independent introductory physics courses. No prerequisite. Laboratory-discussion sections emphasize hands-on experience with apparatus. One course, Vibrations and Waves, deals with sound, light, and water waves. Annual enrollment: 1450. The other course, Energy, deals with the various forms of energy and their mutual transformations, first and second law, elementary concepts of entropy. Annual enrollment: 1090.

Other descriptions:
Article in preparation. Visitors and inquiries welcome.

Contact:
Leonard E. Jossem, Chairman, Department of Physics, Ohio State University, 174 W. 18th Avenue, Columbus, Ohio 43210, (614) 422-5713.

the next experiment. During the two hours several low-key bursts of student activity alternate with explanatory discussions. The students are not required to write lab reports since the instructor makes certain that each of them sees every experiment and thoroughly understands the principles involved.

Vibrations and Waves uses four paperback texts (Willard Bascom's *Waves and Beaches*, Arthur H. Benade's *Horns, Strings and Harmony*, Alexander Efrons's *Exploring Sound*, and Clarence Rainwater's *Light and Color*). The physics department hasn't been able to find acceptable texts for Energy, so students in that course receive departmental notes, as well as printed summaries of the films shown in lectures and a list of five to ten review questions covering each lab—similar to questions they will find on exams. Students' grades are based on two one-hour, multiple-choice exams administered in the group lecture meeting and a similar two-hour final.

Since Vibrations and Waves has 15 sections and Energy 11, many instructors drawn from many specialties within physics are needed to staff them. Inevitably, some of the physics faculty who teach the course find they need to review a few of the principles involved in class experiments. And a few instructors have to learn how to operate the equipment. (One professor of high energy theoretical physics freely admits that the first time he taught the course he spent an average of two hours before each lab learning how each piece of apparatus worked.)

Every instructor receives a manual for each lab session that includes a list of instructional objectives (to keep lessons consistent from section to section), a suggested order of presentation, lists of equipment and visual aids, instructions for each piece of equipment, and sheaves of technical articles, popular articles, and newspaper clippings pertinent to each concept presented during the lab. These manuals save new instructors hours of background research in the library (OSU's physics library contains more than 35,000 volumes). These manuals, Jossem emphasizes, are meant as teaching aids, not straitjackets.

Many students enter the course paralyzed by a fear of scientific apparatus. "Some have never turned a knob in their lives," reports Jossem. Instructors work to help students over this fear. It seldom takes long. During one class I attended, I was struck by the students' itchy fingers. As soon as they came into class they began handling the equipment set out for the day, clearly curious as to its function. After each phenomenon had been observed (frequently accompanied by quiet chuckles of discovery), many students continued to play with the equipment. If their enthusiasm didn't bubble—these were not, after all, students who expected to be excited by scientific discoveries—nevertheless, their awakened curiosity was unmistakable.

> *Inevitably, some of the physics faculty find they need to review a few of the principles involved in class experiments. One professor of high energy theoretical physics freely admits that the first time he taught the course he spent an average of two hours before each lab learning how each piece of apparatus worked.*

The ultimate aim of the course is to capitalize on this curiosity and to prove to students that they can understand the physical world around them. In addition, of course, there are countless questions that can be answered based on the few physical principles taught in each version of the course ("Why is the sky blue?" "In a loudspeaker, why is the woofer larger than the tweeter?"). Students learn how to measure the speed of sound, how to make their own box cameras, and how to calculate the costs of running home appliances using the

Videocassettes — The Ever-Ready Lecturer

In physics classrooms across the country, lectures are becoming obsolete. They have been replaced not by a machine but by a method—the personalized system of instruction (PSI), also known as the self-paced course. Students in PSI courses are provided with a body of knowledge and a semester in which to learn it. They absorb the material at their own pace, taking their instruction from texts, problems, frequent tests, and individual tutorial sessions.

Although lectures are often included in a PSI syllabus, professors ruefully realize how irrelevant they necessarily must be. Few students in a course are likely to pace themselves in strict accordance with the professor's lecture schedule; his words come too soon for the slower students in the class, too late for the faster ones, and for this reason generally are of very little help in the students' learning process.

L. David Roper of Virginia Polytechnic Institute and State University, professor of physics and firm advocate of the self-paced system, delivered lectures to half-empty PSI classrooms for years before he decided to end the charade. Unlike many of his colleagues, though, Roper refused to abandon the spoken word as a highly effective means of presenting difficult material. Instead, he devised a system for integrating his lectures tightly into the PSI syllabus, insuring their availability to every student in the course when and if they were needed, regardless of the speed at which the students were progressing through the material.

Roper chose to use the videotaping machine VPI&SU had acquired several years before. He secured a small university grant to pay for his supplies, then spent several months delivering all the lectures for a PSI course with no audience but camera and microphone. The videocassettes he produced were placed at the disposal of his students, to be used or ignored as they liked. In a careful study, Roper compared these students' progress through the course with that of their predecessors, who had taken the same course with optional live lectures instead of the optional cassettes. The outcome convinced both him and his students that taped lectures are a worthwhile addition to any PSI course.

The testing ground for Roper's taped lecture system was his Introduction to Quantum Mechanics, a senior-level course with an enrollment of 20 to 30 students, now in its third year of lecture videocassette use. The 26 taped lectures for the course are kept in the physics department's audiovisual lab, a room set

various forms of energy available.

The popularity of the course, emphatic from the first, shows no signs of slackening, and the student evaluation forms, solicited at the end of every course at OSU, have often rated both Vibrations and Waves and Energy a full letter grade higher than most other courses in the physics department. But the course's spectrum of grades resembles that of other introductory physics courses at OSU. Appealing to students here, in other words, does not mean pandering. Some students become sufficiently intrigued to take both versions of the course, though few, if any, go on to advanced physics. Students who show signs of long-range interest are advised to take other introductory courses. The demand for places in these classes is too fierce to fill them with students who already suspect that physics can be stimulating.

Setting up such a course is unquestionably expensive. The physics department begged, borrowed, and built its own equipment, ranging from $5,000 oscilloscopes to 79-cent Slinkies. Still, it cost roughly $25,000 to equip the two laboratories for Vibrations and Waves, and another $12,000 to outfit Energy. Also, with more than two dozen sections every quarter (fewer in the summer when enrollment drops), the course is a drain on teaching hours. But the original equipment can be constantly reused, and when amortized over the thousands of students the course has already reached, the costs, Jossem feels, are entirely reasonable.

There is a departmental curriculum subcommittee assigned to keep all physics courses from drifting, but the only aspect of this course that seems in any way in trouble is exam questions. Old exams circulate and multiple-choice questions can only be phrased in so many different ways. The faculty members assigned to write the tests are finding them harder and harder to create. A partial solution to this problem, very much in the spirit of the course, has been to relate questions to current events whenever possible. For instance, an old athletics field house on the OSU campus has recently been closed to rock concerts because of a weakened balcony—a fact that may be useful for several questions regarding the physical consequences of resonance.

Faculty enthusiasm remains fervent. "One remarkable thing about the course," summarizes the physics chairman, "is that we've been able to maintain faculty interest in it." And the credit for maintaining student interest in a field where it is all too often absent belongs to those who teach Physics 100.01 and 100.02. ■

aside for all media-related undergraduate teaching aids and open for student use five afternoons and one evening a week. Students are told at the beginning of the semester that the lectures are entirely optional, but that they constitute, in and of themselves, a fairly comprehensive summary of the course as well as a detailed explication of all its most difficult parts. Roper's studies show that about half of the students view his lectures, nearly the same percentage as had attended his live presentations.

The taped lectures, however, offer both Roper and his students opportunities impossible to exploit in a standard lecture hall. Roper has the time to painstakingly prepare for each lecture before he delivers it, spending about an hour and a half transcribing all the equations he will use during the lecture in multicolored chalk on the taping studio blackboard. For the benefit of students listening to the lecture on the audiocassettes the studio also produces, Roper handwrites and mimeographs facsimiles of the blackboard. Compared to his live lectures, he feels the taped ones are far better organized and prepared—not perfect, but pretty nearly so. And they give students a privilege unknown in other courses, that of making the professor repeat murky parts of the lecture as many times as they like.

Students' reactions to the taped lectures are difficult to separate out from their assessments of the other features of Roper's PSI courses. They strongly approve of the abundance of tutors he selects from students in the course, the mathematics review units he has devised to augment weak math backgrounds, the delicately balanced point system that awards every student who successfully completes the course an A, and his own determination to be available for all who need help. Comments on the extensive student questionnaires he collects range from "best physics course I've ever had" to the more sober "procrastination was my biggest problem." But many make grateful mention of the "tremendous amount of work the instructor has done," and the great value of the tapes as a backup resource when both text and tutors fail to clarify a concept.

Roper's ability for making self-paced courses work is also evidenced by a survey of the extent to which VPI&SU now utilizes his techniques. The introductory astronomy class, with an enrollment of nearly 1,000 undergraduates, boasts a complete set of 35 videotaped lectures to flesh out its PSI structure. The sophomore physics laboratory, also self-paced (students may do a lab at any point during a two-week period), uses videotapes to introduce students to equipment they will be working with for experiments. And Roper's own biophysics course has taken the concept of self-paced instruction off in another direction. The course is composed of four independent units; students complete any two of them, in any order and at any speed they like, in order to finish the course. Not infrequently, students return to complete the other two units in an independent study course, an option the format makes intriguingly easy.

Still wider horizons for the PSI concept have been opened by the videotaped lectures. After publishing in the *American Journal of Physics*, Roper received requests from New York to New Guinea for copies of the cassettes. Instructors without the time, knowledge, or class enrollment for a standard quantum mechanics course have found them a godsend. "There are times when I miss the ego trip of lecturing to a packed classroom," Roper admits. "But there certainly are compensations." Now, ego trip or not, he is lecturing to students around the world.

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Undergraduate Research: Nurturing Dreams of Greatness

"This is your chance to make good to yourself on all those visions of grandeur." That statement is the matter-of-fact introduction to the Undergraduate Research Opportunities Program (UROP) at the Massachusetts Institute of Technology, as set forth in UROP's student directory. As the statement continues, it settles to earth descriptively: "The faculty hereby invites and encourages you to participate in a wide range of research and project activities spanning all 23 academic departments, many offices, several laboratories, and over 300 off-campus industries, agencies, and hospitals."

That skeletal description of UROP does not, of course, convey a full picture of the bold, pioneering program under which undergraduates join faculty researchers on a level formerly regarded as the domain of graduate students. The program has grown dramatically since its inception in 1969 and is regarded as a significant reform movement in higher education.

Within each discipline, UROP's projects touch on virtually every area of specialization. In the physics department there have been dozens of UROP projects in the past eight years, including some that set out to: investigate laser-visualized speech; build detectors for geomagnetic storms; help develop a self-paced physics course for high school students; design and construct a microcalorimeter; calculate shapes of heavy nuclei; and investigate deep-sea diving with advanced closed-circuit scuba.

Sometimes the research progresses in an ideal pattern. A sophomore working in astrophysics, for example, was assigned to circuit testing. He then went into circuit design and next into building parts for a balloon gondola. Later he became involved in launching the balloon, and in data retrieval work at the balloon base; then he began data analysis. Finally, he and his co-workers published their findings.

Rainer Weiss, UROP coordinator for the MIT physics department, believes that one of the most positive aspects of the program is the way it helps some participants launch their careers. In many cases, supervising professors become valuable references at job-hunting time. Weiss also credits the program with providing material for the senior thesis that is obligatory in the physics department. On the negative side, he feels that UROP creates a pressure situation in which students fear that if they "don't do UROP," they will be deemed second-rate.

The mechanics of student enrollment in UROP are sensible and devoid of red tape. In the physics department interested students are encouraged to visit a physics reading room where they may learn what kind of research is being done in the various laboratories. Those who do not find topics that interest them are advised to pursue their own ideas in a physics project lab, where they can work in consultation with faculty. A UROP resource booklet for students, published twice a year, lists participating faculty along with their office and phone numbers and their areas of expertise.

Margaret L.A. MacVicar, an MIT alumna who is a member of the physics department, has been the overall director of UROP since it began. She underscores the visionary approach to the program: "One of the points uppermost in our minds has been to pursue the dream by being very responsive to students' needs and not to become an obstacle to fulfillment of the dream. That is why we try not to become bureaucratic."

MacVicar believes that UROP's growth is due in large measure to the fact that each department functions independently. "Every department has been able to think of UROP as its own, and that sense of departmental ownership is important in the battle against bureaucracy," she observes. Each department has its own UROP coordinator and establishes its own procedures.

When it started, UROP was a fledgling effort involving 150 students. Today, out of a total MIT undergraduate enrollment of 4,400, some 3,000 students participate. Faculty participation in UROP, which is voluntary, currently stands at 60 to 70 percent. As in other departments some physics professors were hesitant at first to commit themselves to the program; but as it progressed, faculty involvement grew. This happened through strong support from the department head, students' enthusiasm, and the persuasive power of personal contact as outstanding undergraduates were matched with formerly reluctant teachers in research projects. One faculty member recently said that institutional support of UROP was essential because the funds and students it provides are of help to young professors who do not have large budgets for research.

There was some speculation at the outset of the program that UROP would generate a drain on faculty time that might necessitate reduction of teaching loads to compensate for time spent in UROP efforts. This has not happened, and while there may be individual differences of opinion, most faculty willingly assume additional responsibilities because they enthusiastically endorse UROP. Department heads, deans, and administrators reportedly take UROP participation into account when they consider promotions and granting of tenure.

Parallel to the growth in faculty support, more and more off-campus groups have become involved in UROP programs. Students now may pursue research projects in industrial and corporate laboratories; hospitals and other medical research facilities, municipal, state, and federal agencies; foreign organizations; and nonprofit agencies in the arts, ecology, and so on. They may choose to initiate their own off-campus projects by enlisting the help of a faculty supervisor and an off-campus professional cosupervisor. To investigate existing off-campus research programs, students check the UROP directory, which publishes an up-to-date, detailed listing.

Here is a listing of some of the many off-campus groups working with UROP this year, along with brief descriptions of their projects:

Air Force Research Lab: research in the physical sciences and engineer-

ing with major emphasis on geophysics and electronics.
Boston Parks and Recreation Department: water quality engineering and forestry.
Harvard Medical School: the use of the electron probe microanalyzer, renal function, and use of the electret effect to study biopolymers.
Children's Museum of Boston: development of innovative educational techniques in computer science and the physical sciences.
IBM: network research, display terminal design, and data migration.
Massachusetts Port Authority: problems in airport management.
New England Aquarium: marine biology and chemistry.
U.S. Department of Transportation: energy costs of high speed travel.

One of the off-campus specialists who work with UROP is scientist and inventor Edwin H. Land, president of the Polaroid Corporation. Land was among the first to advocate an undergraduate research program. In a 1957 lecture at MIT entitled "Generation of Greatness: The Idea of University in an Age of Science," he talked about the gifted undergraduate: "If a way could be found of nurturing the timid dream of his own potential greatness, which he brought from his family and school, if somehow he could tie on to the greatness in the faculty and administration, then his dream might come out differently."

It was Land who provided the initial funding for UROP in 1969 with a $100,000 contribution. By 1974 the annual budget had grown to over $300,000, most of it provided by MIT's general funds. This year the budget is a whopping $1 million, of which MIT provides $280,000 earmarked for purchase of materials and supplies, student stipends, the annual directory, and maintenance of a modest office for the five-person UROP staff.

The remaining funds derive from three sources. Some participating off-campus organizations underwrite specific projects (Massachusetts General Hospital, for example, supports a UROP medical research program). There are gifts from classes, foundations, and from the scientific honorary fraternity Sigma Xi. Where faculty have personal research grants (from a variety of sources, including government and industry) they may use some of those funds for student stipends. This is a budgetary boon.

About 20 percent of UROP students receive some financial support from the program. Stipends average $450 per student per semester, paid at an hourly rate. The policy of payments to students for their UROP work began in 1973; until then, they received academic credit only. But as the program expanded and funding increased, most departments began to offer students their choice of pay or units of credit (on a pass/fail basis). Those who opt for credit may, in most cases, continue their projects into the summer months for pay.

In the physics department there are no stipends during the school year for the 140 UROP participants, but summer employment for pay is virtually guaranteed. This gives the department a maximum number of students for full-time work during the summer when the physics faculty is most heavily involved in research projects. And it illustrates UROP's precept that the program should reflect the needs of the departments.

UROP has thus far produced both tangible and intangible results. It has given new direction to many careers: One student who planned a future in biology switched to medicine as a result of her UROP work on tumor research. Another student abandoned plans for medical school when, through her work in a hospital, she discovered that she had little aptitude for medical procedures. Some undergraduate researchers have patented inventions they developed under the program: an X-ray processor, for example, and a heart valve. Dozens of students have published articles in scholarly journals, either on their own or in collaboration with UROP faculty participants.

Alumni groups in many cities have expressed a strong interest in UROP and have invited student researchers to speak at their meetings. Thus, from the University's standpoint, UROP has provided a new bond with alumni that fosters goodwill and may pay dividends in the years ahead.

Of course, the program is not without its disappointments. One student, in evaluating his work, said: "I suffered through an extraordinarily frustrating and consequently demotivating project and wound up giving and receiving much less than what was possible." But he concluded that it wasn't a total loss: "The experience was educational; I did learn from my mistakes." UROP also fosters perseverance. One student wrote: "My particular project dealt with the MIT Man-Powered Aircraft Project, BURD. Our program recently suffered a setback, leaving us with a sound design but no airplane. We'll rebuild this summer and have a new one flying soon."

Most students' comments border on the ecstatic: "This has been the most beneficial learning experience I have had at MIT. The people with whom I worked earned my respect for their professionalism and dedication and provided me with an invaluable understanding of science and scientists unobtainable in a classroom." And: "I can say without reservation that my undergraduate research experience has been the most important factor in my intellectual and professional development at MIT."

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> *"Some physics professors were hesitant at first to commit themselves to the program; but as it progressed, faculty involvement grew. This happened through strong support from the department head, students' enthusiasm, and the persuasive power of personal contact.*

Streamlining the Physics Lab

"Eureka!" is a cry not generally heard in undergraduate physics laboratories; all too often, "What was *supposed* to happen?" resounds through the corridors instead. As hundreds of students grapple with each other to unearth missing equipment, locate elusive lab instructors, decipher incomprehensible instructions, and reconcile aberrant data with the theories they are attempting to prove, the beauty and precision of scientific method are usually lost in the shuffle.

Nearly three years ago a group of physics professors at North Texas State University decided to call an end to the massive frustrations and wasted time that were endemic to their department's undergraduate laboratories. Their efforts culminated in September 1977 in the opening of the University's Physics Instructional Center, a $750,000 investment designed to streamline the undergraduate laboratory experience. Funded partially by the University and partially by a National Science Foundation CAUSE grant, the Center represents both a pioneering venture in the application of audiovisual technology to education and a new incarnation for that battered and venerable institution, the undergraduate lab.

The 530 students enrolled in the University's two introductory physics courses (one each for science and nonscience majors) have been cast as guinea pigs for the Center's first trial run. Up to now, students performed the work in traditionally scheduled group labs, doing each experiment on a certain day at a specified time and presenting their findings in rigorous write-ups. This year their laboratories are essentially self-paced structures in which overcrowding and wasted time have been reduced to a minimum.

A student can perform each of the 12 labs included in his course at any time during a fixed two-week period (or, with the payment of a $5 late fee, at any other time during the academic year). He checks into the Center, seats himself in a specially constructed carrel, and plugs a videotape cassette into a projector. The cassette consists of a 10-minute introduction to the experiment he is about to perform, presented by one of the course instructors. The instructor explains each piece of equipment the experiment will entail, performs the experiment for the student, and reads out the data obtained.

When the student has finished with the tape he moves to another area of the Center, where he performs the experiment himself. The apparatus needed is laid out for him and two or three laboratory assistants are on hand to answer questions. When he is done he brings his data and conclusions to an assistant, who checks through them. If they are grossly inadequate the student is sent back to repeat the experiment. Otherwise he moves on to another room, where he takes a short test on the experiment and the concepts it was supposed to illustrate. A graduate student marks the test immediately. A grade above 80 means the student has finished with the lab; a lower grade means he will take another test and repeat the process as many times as necessary until he passes.

At present the Center has 21 carrels in its "assimilation room," which is open for student use five days and two evenings a week. In addition to the assimilation and laboratory space, though, the Center also houses a darkroom, a graphics studio, and a production studio where all the videotapes are made. These facilities render the operation autonomous—and its potential for expansion essentially unlimited. According to Virginia Rawlins, assistant professor of physics and associate director and coordinator for the Center, the department will eventually direct the laboratory work—and some of the course work—of its 2,000 undergraduate students through the resources of the Center. In addition, a media library is planned which will enable students to investigate via slides or videotapes any piece of equipment or experimental setup the department has in its possession.

Meanwhile, however, even in its initial abbreviated state, the Center is living up to its founders' expectations. The massive evaluation required by NSF, which will examine the effect of the Center on students' laboratory expertise and on their attitudes about the course and about science in general, has not yet been conducted. However, Rawlins notes that students seem more than satisfied with the direction their scientific education has taken. In spite of an occasional "all full" sign posted on the door of the assimilation room, overcrowding and other frustrations have essentially disappeared. Students delight in knowing exactly what they are supposed to do and how it is supposed to turn out.

Although several other universities in the country have fledgling media-based laboratories, none approximate the Center in either extent or expense. As an example of a well-planned technological innovation it is arousing a certain national curiosity; from the other science departments at North Texas State it has won a more tangible approval. Both chemistry and biology students have already petitioned to be allowed to use relevant tapes: Rawlins hypothesizes that in time the Center may well turn into a clearinghouse for an interdisciplinary spectrum of scientific how-to knowledge.

In the meantime, the physics department is slowly recovering from the birth of its offspring. The construction of the Center entailed a year of upheaval, including the extensive renovation of the department's 15-year-old building, the hiring of several media and graphics experts to supplement the department's own staff, and the purchase of a great deal of new equipment (all under the condition that tapes detailing each item's use be made and stored in the Center). With more funding more renovation may be forthcoming, and computer-mediated facilities may be introduced to systematize the Center still further. But for now the dust is clearing, last year's rigorous schedule has been relaxed somewhat, and department members can begin to enjoy the aftermath of their film debuts.

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A Keller Plan Clearinghouse

If there's anything you want to know about teaching physics via the Keller Plan, ask Robert Fuller at the University of Nebraska in Lincoln. He's been using and refining the method since 1971 and has managed to entice a number of his colleagues, at UNL and elsewhere, into the fold. Also known as the personalized system of instruction (PSI), the method was part of Fuller's repertoire for nearly two semesters when UNL's teaching council, which sponsors monthly seminars, invited him to talk about it. Subsequently, the council provided funds for Fuller to attend a conference on PSI at the Massachusetts Institute of Technology, and it was there he discovered he was not the only instructor who felt awkward teaching the plan with no back-up materials: "During two days of lectures," Fuller says, "everybody was apologizing for not having printed information that illustrated the plan."

Thus inspired, Fuller wrote a general guide to the method and produced a film showing it actually in use. Realizing that PSI would probably find wider acceptance around the country if professors didn't have to undertake the Herculean task of designing their own materials, he organized a workshop to create a series of study guides and examinations. (For other descriptions of PSI, see the Index in this issue under Self-Paced Instruction.)

To leapfrog the potential hurdle posed because materials are often tailored to the instructor who writes them—and therefore difficult for others to use—he secured a grant from the National Science Foundation (NSF) and gathered 15 physicists from other institutions who each had at least a year's experience teaching with the Keller Plan. The group spent three weeks developing a complete set of PSI modules in physics: Each includes learning objectives, references to assignments in four leading textbooks, exercises with solutions, a practice test, and three forms of mastery tests with grading keys.

Forty-three study modules for physics were completed, plus three calculus background modules, an orientation module, review tests, and an appendix on the use of the Keller Plan. Intended for use in the calculus-based general physics course traditionally required for engineering students and physical science majors, the modules were tried out on five students hired as part of the workshop staff, who worked all the exercises and mastery tests. To date 1,300 sets of modules have been sold to 790 institutions from universities to junior high schools, and Fuller is negotiating with a publisher for commercial distribution.

Fuller sees a need for similar teaching aids that relate physical science concepts to their biological applications. He has received NSF funds for a project to create modular instructional materials for use in introductory physics and in chemistry courses for premedical, predental, preveterinary, nursing, and other students interested in the health sciences.

In 1975 UNL's physics department evaluated the Keller Plan and decided to offer a PSI section in all its introductory courses. So far nine different courses using some form of the plan have been taught there; Fuller and his colleagues have developed a number of adaptations: David Joseph includes mini-experiments—at least one of his test questions requires the student to do a brief measuring exercise. Paul Byerly, concerned about the exchange of information about test questions among his premed students, had begun to wonder, "Am I really testing them or am I testing their friends?" His solution was to feed test questions into the computer, which manipulates them so that the basic exercises are the same but answers and details differ. In this way questions can be extensively varied. Fuller himself applies Piagetian principles to the mastery tests, analyzing students' answers and constantly redesigning questions to prevent the same failures.

Fuller has influenced other UNL faculty to teach by the Keller method. "Many departments are using it as a result of the noise I've made," Fuller notes with amusement. "When one person experiments with something different and draws the flak and notoriety, it breaks the ice for others. In the physics department my first converts were delighted to find that their student evaluations went way up. Some people who care deeply about teaching don't give effective lectures—they aren't Bob Hope, their styles aren't flashy, and students often don't perceive that they care. These people are prime candidates for the Keller Plan, in which students see the professor as a facilitator of learning. If these teachers weren't deeply committed, they wouldn't be willing to do the large amount of work the method requires." Some try it and are disillusioned: "The faculty says the Keller Plan should be treated like any other course, that it doesn't increase your workload," Byerly notes. "But it does, and some resent that."

Another technique Fuller is working with is transactional analysis (TA), the human behavior theory popularized by such books as *Games People Play* and *I'm OK, You're OK*. In a course that combines TA with an inquiry approach to physics and elementary school science teaching methods, he attempts to "make a frontal assault on apprehensive feelings about science, which teachers-in-training often go on to communicate to their pupils. In effect, they don't feel OK about it, and we use self-awareness exercises to try to change this in prospective teachers traumatized by a physics lab." Fuller has also used TA to train graduate students for tutoring in his Keller courses, and he is seeking federal funds for a workshop to introduce physicists to TA as a way of improving teaching quality.

Though Fuller occasionally encounters resistance to ideas that are considered too far out he doesn't let it stop him. "He's a very infectious person, very convincing," says Norman Chonacky, a colleague. "Opposition doesn't get him down." Agrees Fuller, "The key to innovation in education is persistence. I never give up."

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The learning experiences presented in the first five Reports on Teaching are included here in a subject index designed for those interested in a particular approach to teaching. It is divided into four main headings: (1) teaching strategies, including various techniques used in the learning experience from lecturing and team teaching to the use of multi-media and computers; (2) focus, indicating the general direction of the studies, whether for career orientation, underprepared students, etc.; (3) evaluation, noting various approaches to grading; and (4) course management, listing those learning experiences that are interdisciplinary or a modification of the traditional approach. Overview articles are those written by the project staff or by the association representative from each of the disciplines appearing in the Reports.

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